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DRAFT FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY ACT WORK PLAN VOLUME 2 OF 2 CNC CHARLESTON SC
8/17/1992
ENSAFE

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION CHARLESTON NAVAL SHIPYARD CHARLESTON, SOUTH CAROLINA

DRAFT-FINAL RFI WORKPLAN CHARLESTON NAVAL SHIPYARD

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
Washington, DC

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Volume II

APPENDIX A

Lithologic Logs

(Source: Reference 12)

LITHOLOGIC LOG OF WELL CP-1

Description	Depth (ft)	Thickness (ft)
Clay, slightly sandy, light tan to gray...	0 - 10	10
Clay, gray, soft, with organic debris and a trace of fine sand.....	10 - 15	5
Sand, stiff, gray, with a trace of clay and scattered shell fragments.....	15 - 23	8
Clay, soft, calcareous, brownish-gray.....	23 - 25	2

LITHOLOGIC LOG OF WELL CP-2

Description	Depth (ft)	Thickness (ft)
Clay, slightly sandy, tan.....	0 - 3	3
Clay, sandy, very stiff, grayish-tan.....	3 - 10	7
Clay, plastic, gray, with a trace of silt.	10 - 15	5
Clay, sandy, soft, gray.....	15 - 21.5	6.5
Clay, stiff, calcareous, slightly sandy, grayish-green.....	21.5 - 25	3.5

LITHOLOGIC LOG OF WELL CP-3

Description	Depth (ft)	Thickness (ft)
Clay, slightly sandy, tan to reddish-brown.....	0 - 2	2
Sand, fine-grained, slightly clayey, dark gray to black.....	2 - 8	6
Clay, plastic, gray, with a trace of silt.	8 - 14	6
Clay, slightly sandy, stiff, gray, scattered shell fragments.....	14 - 18.5	4.5
Clay, calcareous, soft, slightly sandy, brownish-green.....	18.5 - 25	6.5

LITHOLOGIC LOG OF WELL CP-4

Description	Depth (ft)	Thickness (ft)
Clay, slightly sandy, medium stiff, tan...	0 - 2	2
Sand, fine-grained, gray, with a trace of clay and scattered small shell fragments..	2 - 8	6
Clay, soft, dark gray, with scattered decaying vegetable matter.....	8 - 18	10
Clay, medium stiff, gray, with scattered roots.....	18 - 23	5
Sand, fine-grained, slightly clayey, tan.....	23 - 25	2

LITHOLOGIC LOG OF WELL CD-1

Description	Depth (ft)	Thickness (ft)
Sand, medium-grained, with a trace of small shell fragments.....	0 - 5	5
Clay, soft, gray, with laminations of fine sand.....	5 - 10	5
Sand, medium grained, gray, with a trace of clay.....	10 - 12	2
Clay, soft, gray, with laminations of fine sand and decaying wood.....	12 - 16.5	4.5

LITHOLOGIC LOG OF WELL CD-2

Description	Depth (ft)	Thickness (ft)
Clay, very soft, brown.....	0 - 5	5
Clay, very soft, green, with decaying vegetable matter.....	5 - 15	10

LITHOLOGIC LOG OF WELL CD-3

Description	Depth (ft)	Thickness (ft)
Clay, stiff, tan, with a trace of sand and scattered roots.....	0 - 4	4
Clay, soft, dark gray, with decaying wood fragments.....	4 - 10	6
Clay, very soft, gray, with decaying wood fragments and a trace of silt.....	10 - 11.5	1.5
Clay, very soft, dark gray.....	11.5 - 15	3.5

LITHOLOGIC LOG OF WELL CD-4

Description	Depth (ft)	Thickness (ft)
Clay, stiff, tan, slightly sandy, with scattered roots.....	0 - 4	4
Clay, soft, dark gray.....	4 - 10	6
Clay, very soft, dark gray, with a trace of silt and scattered laminations of fine sand.....	10 - 14	4
Clay, calcareous, hard, brownish-green, with a trace of sand and fragments of decaying wood.....	14 - 16.5	2.5

LITHOLOGIC LOG OF WELL CD-5

Description	Depth (ft)	Thickness (ft)
Clay, very soft, dark gray.....	0 - 5	5
Sand, fine grained, slightly clayey, gray.....	5 - 10	5

LITHOLOGIC LOG OF WELL LF-1

Description	Depth (ft)	Thickness (ft)
Sand, medium-grained, with gravel and a trace of clay.....	0 - 8.5	8.5
Clay, very soft, dark gray, with scattered gravel and decaying vegetable matter.....	8.5 - 16.5	8
Clay, very soft, gray.....	16.5 - 25	8.5

LITHOLOGIC LOG OF WELL DLF-1

Description	Depth (ft)	Thickness (ft)
Fill - gravel, sand, debris	0 - 12	12
Clay, soft, gray, with a trace of sand....	12 - 20	8
Clay, soft, gray.....	20 - 32	12
Clay, soft, gray, with a trace of sand and shell fragments.....	32 - 45	13
Clay, hard, calcareous, slightly sandy, grayish-green	45 - 62	17

LITHOLOGIC LOG OF WELL LF-2

Description	Depth (ft)	Thickness (ft)
Sand, medium-grained, with gravel.....	0 - 5	5
Clay, very soft, gray.....	5 - 11	6
Clay, very soft, dark gray, with decaying vegetable matter.....	11 - 20	9

LITHOLOGIC LOG OF WELL LF-3

Description	Depth (ft)	Thickness (ft)
Fill - sand and gravel.....	0 - 4	4
Clay, calcareous, hard, dark green, with some sand and gravel.....	4 - 13	9
Clay, soft, dark gray.....	13 - 20	7
Clay, soft, dark gray, with a trace of sand and scattered shell fragments.....	20 - 22	2
Sand, fine grained, clayey, dark gray, with fragments of decaying wood.....	22 - 25	3

LITHOLOGIC LOG OF WELL LF-4

Description	Depth (ft)	Thickness (ft)
Fill - gravel and sandy clay.....	0 - 7	7
Clay, soft, gray, with a trace of gravel..	7 - 15	8
Clay, soft, grayish-green, with scattered laminations of very fine sand.....	15 - 18.5	3.5
Clay, plastic, dark gray, with scattered shell fragments and pieces of decayed vegetable matter.....	18.5 - 22	3.5
Clay, stiff, calcareous, green, with a trace of sand.....	22 - 25	3

LITHOLOGIC LOG OF WELL LF-5

Description	Depth (ft)	Thickness (ft)
Sand, fine grained, tan, with gravel and debris (fill).....	0 - 5	5
Gravel, clayey (fill).....	5 - 13	8
Clay, soft, dark gray, with scattered pieces of decaying wood.....	13 - 21	8
Clay, soft, gray, with scattered shell fragments.....	21 - 31	10

LITHOLOGIC LOG OF WELL LF-6

Description	Depth (ft)	Thickness (ft)
Clay, stiff, dark brown, with a trace of sand, wood, and gravel (fill).....	0 - 1.5	1.5
Clay, very soft, dark gray, with roots....	1.5 - 4	2.5
Clay, very soft, dark gray.....	4 - 15	11

LITHOLOGIC LOG OF WELL LF-7

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, loose, brown, with gravel and wood (fill).....	0 - 2.5	2.5
Sand, fine-grained, clayey, loose, dark gray to brown, with gravel and wood (fill)	2.5 - 7.5	5
Sand, fine-grained, loose, gray, with gravel (fill).....	7.5 - 9	1.5
Clay, sandy, stiff, reddish-brown.....	9 - 11.5	2.5

LITHOLOGIC LOG OF WELL LF-8

Description	Depth (ft)	Thickness (ft)
Clay, stiff, dark gray, with gravel (fill)	0 - 1.5	1.5
Sand, wood and gravel, with brick fragments (fill).....	1.5 - 4	2.5
Clay, very soft, dark gray, with decaying vegetable matter.....	4 - 9	5
Clay, very soft, dark gray, with scattered laminations of fine sand.....	9 - 11.5	2.5
Clay, very soft, dark gray.....	11.5 - 15	3.5

LITHOLOGIC LOG OF WELL LF-9

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, clayey, gray, with roots and gravel.....	0 - 1.5	1.5
Clay, medium stiff, greenish-gray, with roots and a trace of sand.....	1.5 - 5	3.5
Clay, stiff, greenish-gray, with shell fragments and a trace of sand.....	5 - 11.5	6.5
Clay, soft, sandy, gray.....	11.5 - 14	2.5

LITHOLOGIC LOG OF WELL LF-10

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, clayey, loose, gray, with roots.....	0 - 1.5	1.5
Clay with gravel and brick fragments.....	1.5 - 4	2.5
Sand, fine-grained, slightly clayey, gray, with pieces of wood.....	4 - 6.5	2.5
Clay, very soft, dark gray, with a trace of sand.....	6.5 - 12.5	6

LITHOLOGIC LOG OF WPA-1

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, dark brown, with roots	0 - 4	4
Sand, fine-grained, slightly clayey, firm, orangish-brown.....	4 - 7.5	3.5
Clay, stiff, slightly sandy, gray.....	7.5 - 9	1.5
Sand, fine-grained, firm, light gray, with a trace of clay.....	9 - 12.5	3.5
Clay, soft, dark gray, with a trace of sand.....	12.5 - 15	2.5

LITHOLOGIC LOG OF WPA-2

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, orangish-brown, with scattered roots.....	0 - 4	4
Clay, sandy, stiff, orangish-brown.....	4 - 6.5	2.5
Sand, fine-grained, clayey, firm, orangish-brown.....	6.5 - 13	6.5
Clay, soft, dark gray.....	13 - 14	1

LITHOLOGIC LOG OF WOC-1

Description	Depth (ft)	Thickness (ft)
Clay, sandy, medium stiff, dark gray to brown.....	0 - 1.5	1.5
Clay, very soft, dark gray, with roots....	1.5 - 6.5	5
Sand, fine to medium-grained, loose, gray, with shell fragments.....	6.5 - 10	3.5

LITHOLOGIC LOG OF WOC-2

Description	Depth (ft)	Thickness (ft)
Sand, clayey, fine-grained, brown.....	0 - 1.5	1.5
Clay, soft, dark gray, with roots.....	1.5 - 6.5	5
Sand, loose, fine to medium-grained, gray, with thin layers of grayish-green clay and scattered shell fragments.....	6.5 - 9	2.5
Sand, loose, fine to medium-grained, with scattered shell fragments.....	9 - 10.5	1.5

LITHOLOGIC LOG OF WELL OPW-1

Description	Depth (ft)	Thickness (ft)
Fill - sand and gravel.....	0 - 2	2
Sand, slightly clayey, gray to brown.....	2 - 3.5	1.5
Sand, fine-grained, tan, with scattered gravel.....	3.5 - 5	1.5
Sand, fine-grained, dark gray to brown, with scattered debris - wood and bricks...	5 - 10	5

LITHOLOGIC LOG OF WELL OPW-2

Description	Depth (ft)	Thickness (ft)
Fill - very hard sand and gravel.....	0 - 2	2
Sand, slightly clayey, fine-grained, tan to brown.....	2 - 4	2

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LITHOLOGIC LOG OF WELL OPW-3

Description	Depth (ft)			Thickness (ft)
Fill - sand and gravel.....	0	-	2	2
Sand, clayey, with gravel (fill).....	2	-	5	3
Sand, fine to medium-grained, gray, with scattered shell fragments and a trace of clay.....	5	-	8	3
Sand, fine to medium-grained, gray, with a trace of clay.....	8	-	10	2

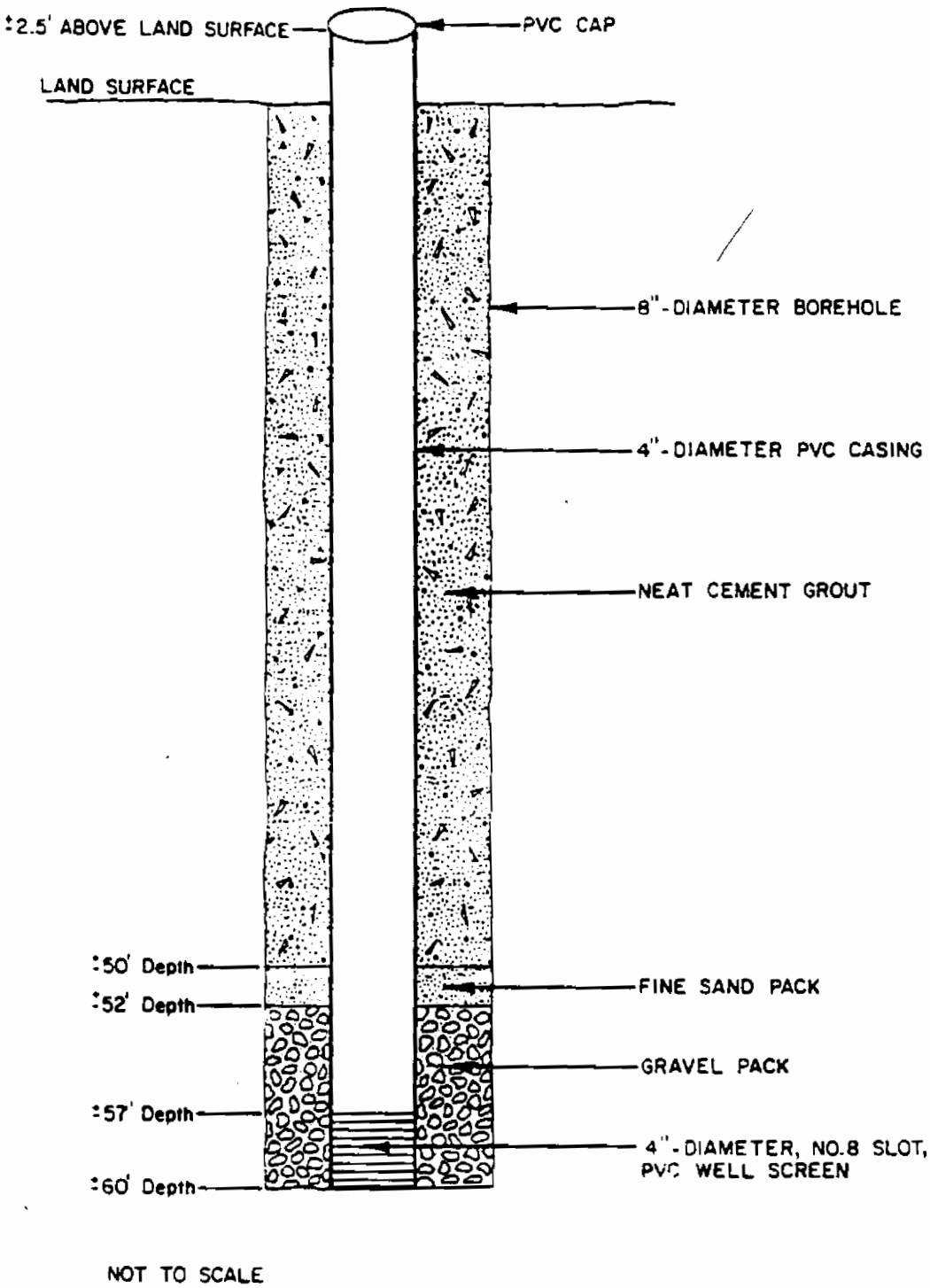

Figure 5. Construction Diagram of Monitor Well DLF-1.

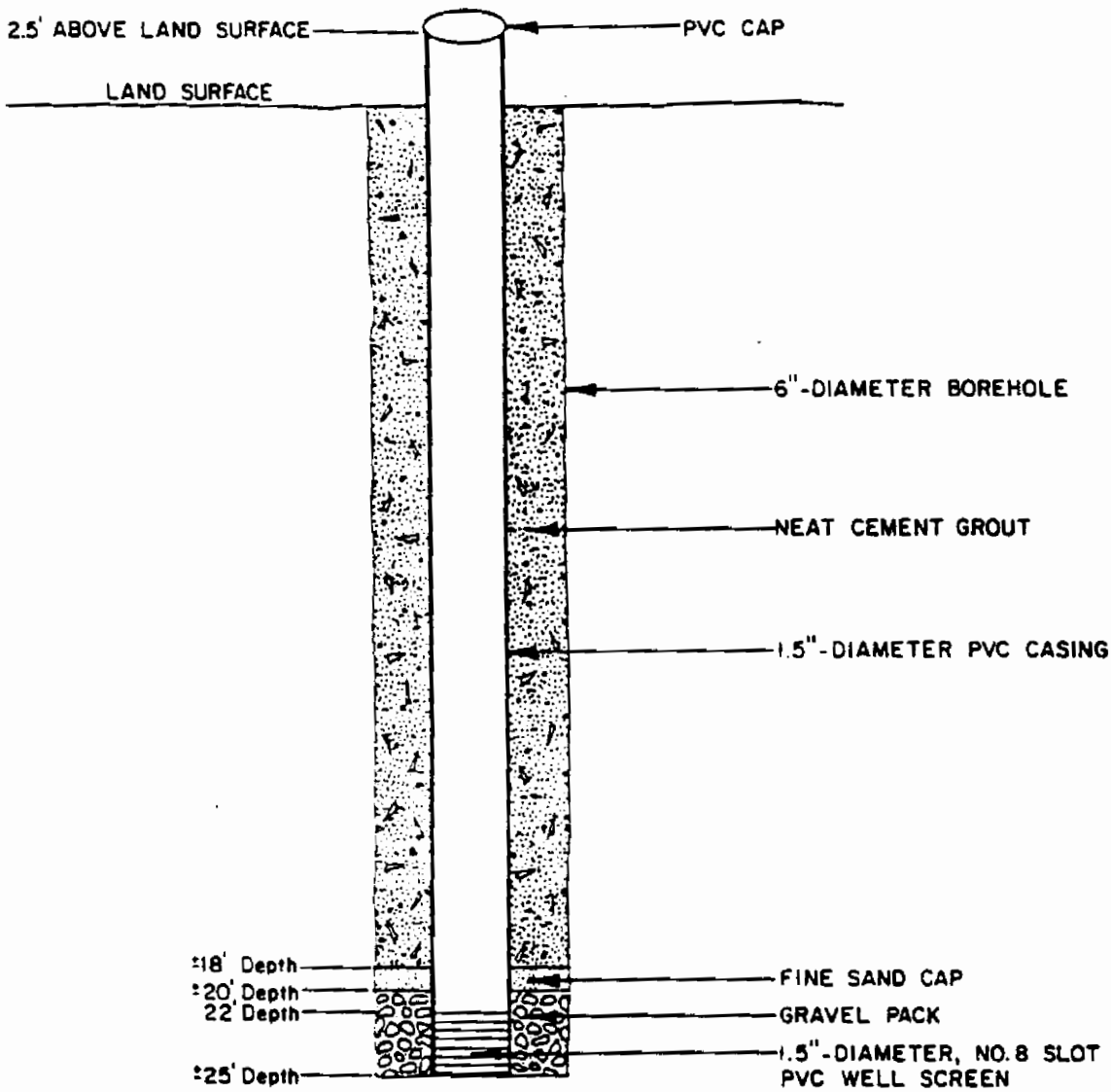

Figure 4. General Construction Diagram of a 1.5-Inch-Diameter Monitor Well.

Table 1 (Continued)

Well No. and Location	Total Depth (ft/bls)[1]	Screen Setting (ft/bls)	Gravel-Pack Setting (ft/bls)
SLF-1	8	5 - 8	3 - 8
SLF-2	8	5 - 8	3 - 8
DLF-1	62	60 - 57	50 - 62
Chemical-Disposal Area			
CD-1	16.5	12 - 15	10 - 16.5
CD-2	15	12 - 15	8 - 15
CD-3	15	12 - 15	8 - 15
CD-4	16.5	12 - 15	8 - 16.5
CD-5	10	7 - 10	4 - 10
Electrical Transformer Storage Area			
WOC-1	10	7 - 10	3 - 10
WOC-2	10.5	7.5 - 10.5	3 - 10.5

1) Feet below land surface.

TABLE 1. CONSTRUCTION DETAILS OF MONITOR WELLS

Well No. and Location	Total Depth (ft/bls)[1)]	Screen Setting (ft/bls)	Gravel-Pack Setting (ft/bls)
Caustic-Pond Area			
CP-1	25	22 - 25	18 - 25
CP-2	25	17 - 20	14 - 25
CP-3	25	22 - 25	18 - 25
CP-4	25	22 - 25	18 - 25
Oil-Sludge Pit Area			
OPW-1	10	7 - 10	4 - 10
OPW-2	4	1 - 4	0 - 4
OPW-3	10	7 - 10	4 - 10
Pesticide-Mixing Area			
WPA-1	13	10 - 13	7 - 15
WPA-2	13	10 - 13	7 - 14
Landfill Area			
LF-1	25	22 - 25	18 - 25
LF-2	20	17 - 20	14 - 20
LF-3	25	22 - 25	18 - 25
LF-4	25	22 - 25	18 - 25
LF-5	31	27 - 30	22 - 31
LF-6	15	5 - 12	7 - 15
LF-7	11.5	7 - 10	4 - 11.5
LF-8	15	12 - 15	7 - 15
LF-9	14	11 - 14	6 - 14
LF-10	12.5	9.5 - 12.5	4 - 12.5

APPENDIX C

Action Level Source Data

(Source: Reference 19, Appendices A through F)

develop and conduct these further Regulatory Impact Analyses.

The new analyses will be conducted in accordance with the existing Agency guidance on Regulatory Impact Analysis and the draft Regulatory Impact Analysis Guidance published in the 1988 Regulatory Program of the United States. The analyses will explicitly examine the costs, health and environmental benefits, and technological limitations for the key regulatory requirements contained in the proposal—especially for the several alternative approaches to ground water remediation outlined in the proposed rule. This analysis will also estimate the aggregate impacts, identified above, for sites eligible for remediation under this rule and for those sites which are listed on the NPL, and will, therefore, look to this rule as an ARAR, under the provisions of CERCLA. Upon completion of the revised analyses, EPA will solicit comment on the results of the analyses and the methodology used to derive them. The Agency will then assess these comments, along with comments which will have been received previously on the proposed rule. Through these actions EPA will ensure that the net social benefits (including environmental and health benefits) of the rule proposed today are maximized, taking into account costs, technological limitations, risks, and realistic assessments of both actual and reasonably expected uses of each site. If the revised RIA, together with the comments received, demonstrate that the rule proposed today does not achieve this outcome, the Agency will make appropriate modifications to the final rule, or if necessary, will repropose the rule.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act requires Federal agencies to fully analyze the economic effects of regulations on small entities. The Agency analyzed the economic impacts for the regulatory options that are most similar to today's proposed rule (*i.e.*, "Immediate Cleanup to Health-Based Standards" and "Flexible Cleanup to Health-Based Standards").

The RIA assumes that a small business is significantly impacted if its excess of cash flow over ten percent of its total liabilities is insufficient to meet corrective action costs, or if its net income is insufficient to meet its corrective action costs.

For the alternative analyzed, it was found that small firms encounter more severe impacts from the corrective action requirements than large firms. The options most similar to the proposed rule result in incremental impacts (*i.e.*, relative to the baseline) on approximately 9 to 11 percent of small businesses owning RCRA facilities.

Based on the Agency's guidelines for implementing the Regulatory Feasibility Act, the results of the analysis as summarized above, suggest that the proposed rule does not impose significant impacts on small entities.

C. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* Reporting and recordkeeping burden on the public for this collection is estimated at 42,497 hours for the 674 respondents, with an average of 1.151 hours per response. (Burden estimates should include all aspects of the collection effort and may include time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information, *etc.*)

If you wish to submit comments regarding any aspect of the collection of information, including suggestions for reducing the burden, or if you would like a copy of the information collection request (please reference ICR #1451), contact Rick Westlund, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 (202-382-2745); and Tim Hunt, Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

List of Subjects in 40 CFR Parts 264, 265, 270, and 271

Administrative practice and procedure, Corrective action, Hazardous waste; Insurance, Reporting and recordkeeping requirements.

Dated: July 5, 1990.

William Reilly,

Administrator.

XI. Supplementary Documents

APPENDIX A.—EXAMPLES OF CONCENTRATIONS MEETING CRITERIA FOR ACTION LEVELS

(Section 264.521(a)(2)(i-iv))

Constituent name	Class	Air(ug/m^3)	Water (mg/L)	Soils (mg/kg)
Acetone	D		4E−00	8E+03
Acetonitrile	D		2E−01	5E+02
Acetophenone	D	2E−01	4E−00	8E+03
Acrylamide	B2	8E−04	8E−08	2E−01
Acrylonitrile	B1	1E−02	6E−06	1E−00
Aldicarb	D		5E−02	1E+02
Aldrin	B2	2E−04	2E−08	4E−02
Allyl alcohol	D		2E−01	4E+02
Aluminum phosphide	D		1E−02	3E+01
Aniline	B2		6E−09	1E+02
Antimony	D		1E−02	3E+01
Arsenic	A	7E−05	(1)	8E+01
Asbestos (2)	A	2E−02		
Barium cyanide	D		2E−00	6E+03
Barium, ionic	D	4E−01	(1)	4E+03
Benzidine	A	2E−05	2E−07	3E−03
Beryllium	B2	4E−04	8E−08	2E−01
Bis(2-ethylhexyl)phthlate	B2		3E−03	5E+01
Bis(chloroethyl)ether	B2	3E−03	3E−06	6E-01
Bromodichloromethane (3)	B2		3E−05	5E−01
Bromoform (3)	D		7E−01	2E+03
Bromomethane	D	3E+01	5E−02	1E+02
Butyl benzyl phthalate	C		7E−00	2E+04

APPENDIX A.—EXAMPLES OF CONCENTRATIONS MEETING CRITERIA FOR ACTION LEVELS—Continued

[Section 264.521(a)(2)(i-iv)]

Constituent name	Class	Airtug/m^3)	Water (mg/L)	Soils (mg/kg)
Cadmium	B1	6E−04	(1)	4E+01
Calcium cyanide	D		1E−00	3E+03
Carbon disulfide	D		4E−00	8E+03
Carbon tetrachloride	B2	3E−02	3E−04	5E−00
Chloral	D		7E−02	2E+02
Chlordane	B2	3E−03	3E−05	6E−01
Chlorine cyanide	D		2E−00	4E+03
Chlorobenzene	D	2E+01	7E−01	2E+03
Chloroform (3)	B2	4E−02	6E−03	1E+02
2-Chlorophenol	D		2E−01	4E+02
Chromium (VI)	A	9E−05	(1)	4E+02
Copper cyanide	D		2E−01	4E+02
m-Cresol	D		2E−00	4E+03
o-Cresol	D		2E−00	4E+03
p-Cresol	D		2E−00	4E+03
Cyanide	D		7E−01	2E+03
Cyanogen	D		1E−00	3E+03
Cyanogen bromide	D		3E−00	7E+03
DDD	B2		1E−04	3E−00
DDE	B2		1E−04	2E−00
DDT	B2	1E−02	1E−04	3E−00
Dibutyl phthalate	D		4E−00	8E+03
Dibutylnitrosamine	B2	6E−04	6E−05	1E−01
3,3'-Dichlorobenzidine	B2		9E−05	2E−00
Dichlorodifluoromethane	D	2E+02	7E−00	2E+04
1,2-Dichloroethane	B2	4E−02	(1)	8E−00
1,1-Dichloroethylene	C	3E−02	(1)	1E+01
2,4-Dichlorophenol	D		1E−01	3E+02
2,4-Dichlorophenoxyacetic acid	D		4E−01	8E+02
1,3-Dichloropropene	B2		1E−02	3E+01
Dieldrin	B2	2E−04	2E−08	4E−02
Diethyl phthalate	D		3E+01	6E+04
Diethylnitrosamine	B2	2E−05	2E−07	6E−03
Dimethoate	D		7E−01	2E+03
Dimethylnitrosamine	B2	7E−05	7E−07	1E−02
m-Dinitrobenzene	D		4E−03	8E−00
2,4-Dinitrophenol	D		7E−02	2E+02
2,3-Dinitrotoluene (and 2,6-, mixture)	B2		6E−05	1E-00
1,4-Dioxane	B2		3E−09	6E+01
Diphenylamine	D		9E−01	2E+03
1,2-Diphenylhydrazine	B2	4E−03	4E−05	9E−01
Disulfoton	D		1E−03	3E−00
Endosulfan	D		2E−03	4E−00
Endothall	D		7E−01	2E+03
Endrin	D		(1)	2E+01
Epichlorohydrin	B2	6E−01	4E−03	7E+01
Ethylbenzene	D		4E-00	8E+03
Ethylene dibromide	B2	5E−03	4E−07	8E−03
Formaldehyde	B1	8E−02		
Formic acid	D		7E+01	2E+05
Glycidylaldehyde	D		1E−02	3E+01
Heptachlor	B2	8E−04	8E−08	2E−01
Heptachlor epoxide	B2	4E−04	4E−08	8E−02
Hexachlorodibenzo-p-dioxin	B2	6E−07	1E−08	1E−04
Hexachlorobutadiene	C	4E−01	4E−03	9E+01
alpha-Hexachlorocyclohexane	B2	6E−04	6E−08	1E−01
beta-Hexachlorocyclohexane	C	2E−02	2E−04	4E−00
Hexachlorocyclopentadiene	D	7E−02	2E−01	6E+02
Hexachloroethane	C	3E−00	3E−02	6E+01
Hexachlorophene	D		1E−02	2E+01
Hydrazine	B2	2E−04	1E−05	2E−01
Hydrogen cyanide	D		7E−01	2E+03
Hydrogen sulfide	D		1E−01	2E+02
Isobutyl alcohol	D		1E+01	2E+04
Isophorone	C		9E−02	2E+03
Lead	B2		(1)	
Lindane (gamma-hexachlorocyclohexane)	B2/C		(1)	5E−01
m-Phenylenediamine	D		2E−01	5E+02
Maleic anhydride	D		4E−00	8E+03
Maleic hydrazide	D		2E+01	4E+04
Mercury (inorganic)	D		(1)	2E+01
Methacrylonitrile	D	7E−01	4E−03	8E-00
Methomyl	D		9E−01	2E+03
Methyl chlorocarbonate	D			
Methyl ethyl ketone	D	3E+02	2E−00	4E+03
Methyl isobutyl ketone	D	7E+01	2E−00	4E+03
Methyl parathion	D		9E−03	2E+01

APPENDIX A.—EXAMPLES OF CONCENTRATIONS MEETING CRITERIA FOR ACTION LEVELS—Continued

[Section 264.521(a)(2)(i-iv)]

Constituent name	Class	Air(ug/m^3)	Water (mg/L)	Soils (mg/kg)
Methylene chloride	B	3E−01	5E−03	9E+01
n-Nitroso-di-n-butylamine	B2	6E−04	6E−06	1E−01
n-Nitroso-n-ethylurea	B			
n-Nitroso-n-methylethylamine	B2		2E−06	3E−02
n-Nitrosodi-n-propylamine	B2		5E−06	1E−01
n-Nitrosodiethanolamine	B2		1E−05	3E−01
n-Nitrosodiphenylamine	B2		7E−03	1E+[illegible]
n-Nitrosopyrrolidine	B2	2E−03	2E−05	[illegible]
Nickel	D		7E−01	[illegible]
Nickel refinery dust	A	4E−03		
Nitric oxide	D		4E−00	8E+03
Nitrobenzene	D	2E−00	2E−02	4E+01
Nitrogen dioxide	D		4E+01	8E+04
Osmium tetroxide	D		4E−04	8E−01
Parathion	C		2E−01	5E+02
Pentachlorobenzene	D		3E−02	6E+01
Pentachloronitrobenzene	C	1E−01	1E−01	2E+02
Pentachlorophenol	D		1E−00	2E+03
Phenol	D		2E+01	5E+04
Phenyl mercuric acetate	D		3E−03	6E−00
Phosphine	D		1E−02	2E+01
Phthalic anhydride	D		7E+01	2E+05
Polychlorinated biphenyls	B2		5E−06	9E−02
Potassium cyanide	D		2E−00	4E+03
Potassium silver cyanide	D		7E−00	2E+04
Pronamide	D		3E−00	6E+03
Pyridine	D		4E−02	8E+01
Selenious acid	D		1E−01	2E+02
Selenourea	D		2E−01	4E+02
Silver	D		(1)	2E+02
Silver cyanide	D		4E−00	8E+03
Sodium cyanide	D		1E−00	3E+03
Strychnine	D		1E−02	2E+01
Styrene	C		7E−00	2E+04
1,1,1,2-Tetrachloroethane	C	1E−00	1E−02	3E+02
1,2,4,5-Tetrachlorobenzene	D		1E−02	2E+01
1,1,1,2-Tetrachloroethane	C	1E−00	1E−02	3E+02
1,1,2,2-Tetrachloroethane	C	2E−01	2E−03	4E+01
Tetrachloroethylene	B2	1E−00	7E−04	1E+01
2,3,4,6-Tetrachlorophenol	D		1E−00	2E+03
Tetraethyl lead	D		4E−08	8E−03
Tetraethyldithiopyrophosphate	D		2E−02	4E+01
Thallic oxide	D		2E−03	6E−00
Thallium acetate	D		3E−03	7E−00
Thallium carbonate	D		3E−03	6E−00
Thallium chloride	D		3E−03	6E−00
Thallium nitrate	D		3E−03	7E−00
Thallium sulfate	D		3E−03	6E−00
Thiosemicarbazide	D		2E−01	5E+02
Thiram	D		2E−01	4E+02
Toluene	D	7E+03	1E+01	2E+04
Toxaphene	B2	3E−03	(1)	6E−01
1,2,4-Trichlorobenzene	D	1E+01	7E−01	2E+03
1,1,1-Trichloroethane	D	1E+03	3E−00	7E+03
1,1,2-Trichloroethane	C	6E−01	6E−03	1E+02
Trichloroethylene	B2		(1)	6E+01
Trichloromonofluoromethane	D	7E+02	1E+01	2E+04
2,4,5-Trichlorophenol	D		4E−00	8E+03
2,4,6-Trichlorophenol	B2	2E−01	2E−03	4E+01
2,4,5-Trichlorophenoxyacetic acid	D		(1)	8E+02
1,2,3-Trichloropropane	D		2E−01	5E+02
Vanadium pentoxide	D		3E−01	7E+02
Xylenes	D	1E+03	7E+01	2E+03
Zinc cyanide	D		2E−00	4E+03
Zinc phosphide	D		1E−02	2E+01

(1) MCL available; see appendix B.

(2) The air action level for asbestos is measured in units of fibers/milliliters.

(3) There is an MCL for total trihalomethanes, which includes four constituents: bromoform, bromodichloromethane, chloroform, and dibromochloromethane. Concentration derived using exposure assumptions in appendix D and reference doses for systemic toxicants and verified risk-specific doses at 10−6 for Class A and B carcinogens and 10−5 for Class C carcinogens (see section VI.F.2.6 for further discussion).

A, B and C represents class A, B and C carcinogens, respectively; D represents a systemic toxicant.

APPENDIX B—MAXIMUM CONTAMINANT LEVELS

Constituent	MCL (ppm)
Arsenic	0.05
Barium	1
Benzene	0.005
Cadmium	0.010
Carbon tetrachloride	0.005
Chromium VI	0.05
p-Dichlorobenzene	0.075
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007

APPENDIX B—MAXIMUM CONTAMINANT LEVELS—Continued

Constituent	MCL (ppm)
2,4-D	0.1
2,4,5-TP Silvex	0.01
Endrin	0.0002
Fluoride	4.0
Lead	0.05
Lindane	0.004
Mercury	0.002
Methoxychlor	0.1
Nitrate	10

APPENDIX B—MAXIMUM CONTAMINANT LEVELS—Continued

Constituent	MCL (ppm)
Selenium	0.01
Silver	0.05
Toxaphene	0.005
1,1,1-Trichloroethane	0.2
Trichloroethylene	0.005
Trihalomethanes, total [1]	0.10
Vinyl chloride	0.002

[1] Including chloroform, bromoform, bromodichloromethane, and dibromochloromethane

APPENDIX C—RANGE OF CONCENTRATIONS FOR ESTABLISHING MEDIA PROTECTION STANDARDS FOR CARCINOGENS

Constituent name	Class	MaxAir (ug/m 3)	MinAir (ug/m 3)	Max-Water (mg/L)	MinWater (mg/L)	MaxSoil (mg/kg)	MinSoil (mg/kg)
Acetone	D						
Acetonitrile	D						
Acetophenone	D						
Acrylamide	B2	8E-02	8E-04	8E-04	8E-06	2E+01	2E-01
Acrylonitrile	B1	1E-00	1E-02	6E-03	6E-05	1E+02	1E-00
Aldicarb	D						
Aldrin	B2	2E-02	2E-04	2E-04	2E-06	4E-00	4E-02
Allyl alcohol	D						
Aluminum phosphide	D						
Aniline	B2			6E-01	6E-03	1E+04	1E+02
Antimony	D						
Arsenic	A	7E-03	7E-05				
Asbestos (2)	A	2E-00	2E-02				
Barium cyanide	D						
Barium, ionic	D						
Benzidine	A	2E-03	2E-05	2E-05	2E-07	3E-01	3E-03
Beryllium	B2	4E-02	4E-04	8E-04	8E-06	2E+01	2E-01
Bis(2-ethylhexyl)phthalate	B2			3E-01	3E-03	5E+03	5E+01
Bis(chloroethyl)ether	B2	3E-01	3E-03	3E-03	3E-05	6E+01	6E-01
Bromodichloromethane	B2			3E-03	3E-05	5E+01	5E-01
Bromoform	D						
Bromomethane	D						
Butyl benzyl phthalate	C						
Cadmium	B1	6E-02	6E-04				
Calcium cyanide	D						
Carbon disulfide	D						
Carbon tetrachloride	B2	3E-00	3E-02	3E-02	3E-04	5E+02	5E-00
Chloral	D						
Chlordane	B2	3E-01	3E-03	3E-03	3E-05	5E+01	5E-01
Chlorine cyanide	D						
Chlorobenzene	D						
Chloroform	B2	4E-00	4E-02	6E-01	6E-03	1E+04	1E+02
2-Chlorophenol	D						
Chromium (VI)	A	9E-03	9E-05				
Copper cyanide	D						
m-Cresol	D						
o-Cresol	D						
p-Cresol	D						
Cyanide	D						
Cyanogen	D						
Cyanogen bromide	D						
DDD	B2			1E-02	1E-04	3E+02	3E-00
DDE	B2			1E-02	1E-04	2E+02	2E-00
DDT	B2	1E-00	1E-02	1E-02	1E-04	2E+02	2E-00
Dibutyl phthalate	D						
Dibutylnitrosamine	B2	6E-02	6E-04	6E-04	6E-06	1E+01	1E-01
3,3'-Dichlorobenzidine	B2			8E-03	8E-05	2E+02	2E-00
Dichlorodifluoromethane	D						
1,2-Dichloroethane	B2	4E-00	4E-02	4E-02	4E-04	8E+02	8E-00
1,1-Dichloroethylene	C	3E-01	3E-03	6E-03	6E-05	1E+02	1E-00
2,4-Dichlorophenol	D						
2,4-Dichlorophenoxyacetic acid	D						
1,3-Dichloropropene	B2						
Dieldrin	B2	2E-02	2E-04	2E-04	2E-06	4E-00	4E-02
Diethyl phthalate	D						

APPENDIX C—RANGE OF CONCENTRATIONS FOR ESTABLISHING MEDIA PROTECTION STANDARDS FOR CARCINOGENS—Continued

Constituent name	Class	MaxAir (ug/m 3)	MinAir (ug/m 3)	Max-Water (mg/L)	MinWater (mg/L)	MaxSoil (mg/kg)	Min (mg/
Diethylnitrosamine	B2	2E-03	2E-05	2E-05	2E-07	5E-01	5E-03
Dimethoate	D						
Dimethylnitrosamine	B2	7E-03	7E-05	7E-05	7E-07	1E-00	1E-02
m-Dinitrobenzene	D						
2,4-Dinitrophenol	D						
2,3-Dinitrotoluene (and 2,6-, mixture)	B2			5E-03	5E-05	1E+02	1E-00
1,4-Dioxane	B2			3E-01	3E-03	6E+03	6E+01
Diphenylamine	D						
1,2-Diphenylhydrazine	B2	4E-01	4E-03	4E-03	4E-05	9E+01	9E-01
Disulfoton	D						
Endosulfan	D						
Endothall	D						
Endrin	D						
Epichlorohydrin	B2	8E+01	8E-01	4E-01	4E-03	7E+03	7E+01
Ethylbenzene	D						
Ethylene dibromide	B2	5E-01	5E-03	4E-05	4E-07	8E-01	8E-03
Formaldehyde	B1	8E-00	8E-02				
Formic acid	D						
Glycidylaldehyde	D						
Heptachlor	B2	6E-02	6E-04	6E-04	6E-06	2E+01	2E-01
Heptachlor epoxide	B2	4E-02	4E-04	4E-04	4E-06	8E-00	8E-02
Hexachlordibenzo-p-dioxin	B2	6E-05	6E-07	6E-07	1E-08	1E-02	1E-04
Hexachlorobutadiene	C	4E-00	4E-02	4E-02	4E-04	9E+02	9E-00
alpha-Hexachlorocyclohexane	B2	6E-02	6E-04	6E-04	6E+06	1E-01	1E-01
beta-Hexachlorocyclohexane	C	2E-01	2E-03	2E-03	2E-05	4E+01	4E-01
Hexachlorocyclopentadiene	D						
Hexachloroethane	C	3E+01	3E-01	3E-01	3E-03	5E+03	5E+01
Hexachlorophene	D						
Hydrazine	B2	2E-02	2E-04	1E-03	1E-05	2E+01	2E-01
Hydrogen cyanide	D						
Hydrogen sulfide	D						
Isobutyl alcohol	D						
Isophorone	C			9E-01	9E-03	2E+04	2E+02
Lead	B2						
Lindane (gamma-hexachlorocyclohexane)	B2/C			3E-03	3E-05	5E+01	5E
m-Phenylenediamine	D						
Maleic anhydride	D						
Maleic hydrazide	D						
Mercury (inorganic)	D						
Methacrylonitrile	D						
Methomyl	D						
Methyl chlorocarbonate	D						
Methyl ethyl ketone	D						
Methyl isobutyl ketone	D						
Methyl parathion	D						
Methylene chloride	B	3E+01	3E-01	5E-01	5E-03	8E+03	8E+01
n-Nitroso-di-n-butylamine	B2	6E-02	6E-04	6E-04	6E+06	1E-01	1E-01
n-Nitroso-n-ethylurea	B						
n-Nitroso-n-methylethylamine	B2			2E-04	2E-06	3E-00	3E-02
n-Nitrosodi-n-propylamine	B2			5E-04	5E-06	1E+01	1E-01
n-Nitrosodiethanolamine	B2			1E-03	1E-05	3E+01	3E-01
n-Nitrosodiphenylamine	B2			7E-01	7E-03	1E+04	1E+02
n-Nitrosopyrrolidine	B2	2E-01	2E-03	2E-03	2E-05	3E+01	3E-01
Nickel	D						
Nickel refinery dust	A	4E-01	4E-03				
Nitric oxide	D						
Nitrobenzene	D						
Nitrogen dioxide	D						
Osmium tetroxide	D						
Parathion	C						
Pentachlorobenzene	D						
Pentachloronitrobenzene	C	1E-00	1E-02				
Pentachlorophenol	D						
Phenol	D						
Phenyl mercuric acetate	D						
Phosphine	D						
Phthalic anhydride	D						
Polychlorinated biphenyls	B2			5E-04	5E-06	9E-00	9E-02
Potassium cyanide	D						
Potassium silver cyanide	D						
Pronamide	D						
Pyridine	D						
Selenious acid	D						
Selenourea	D						
Silver	D						
Silver cyanide	D						
Sodium cyanide	D						
Strychnine	D						

APPENDIX C—RANGE OF CONCENTRATIONS FOR ESTABLISHING MEDIA PROTECTION STANDARDS FOR CARCINOGENS—Continued

Constituent name	Class	MaxAir (ug/m 3)	MinAir (ug/m 3)	Max-Water (mg/L)	MinWater (mg/L)	MaxSoil (mg/kg)	MinSoil (mg/kg)
Styrene	C						
1,1,1,2-Tetrachloroethane	C	1E+01	1E-01	1E-01	3E+03	3E+03	3E+01
1,2,4,5-Tetrachlorobenzene	D						
1,1,1,2-Tetrachloroethane	C	1E+01	1E-01	1E-01	1E-03	3E+03	3E+01
1,1,2,2-Tetrachloroethane	C	2E-00	2E-02	2E-02	2E-04	4E+02	4E-00
Tetrachloroethylene	B2	1E+02	1E-00	7E-02	7E-04	1E+03	1E+01
2,3,4,6-Tetrachlorophenol	D						
Tetraethyl lead	D						
Tetraethyldithiopyrophosphate	D						
Thallic oxide	D						
Thallium acetate	D						
Thallium carbonate	D						
Thallium chloride	D						
Thallium nitrate	D						
Thallium sulfate	D						
Thiosemicarbazide	D						
Thiram	D						
Toluene	D						
Toxaphene	B2	3E-01	3E-03	3E-03	3E-05	6E+01	6E-01
1,2,4-Trichlorobenzene	D						
1,1,1,Trichloroethane	D						
1,1,2-Trichloroethane	C	6E-00	6E-02	6E-02	6E-04	1E+03	1E+01
Trichloroethylene	B2			3E-01	3E-03	6E+03	6E+01
Trichloromonofluoromethane	D						
2,4,5-Trichlorophenol	D						
2,4,6-Trichlorophenol	B2	2E+01	2E-01	2E-01	2E-03	4E+03	4E+01
2,4,5-Trichlorophenoxyacetic acid	D						
1,2,3-Trichloropropane	D						
Vanadium pentoxide	D						
Xylenes	D						
Zinc cyanide	D						
Zinc phosphide	D						

Appendix D: Recommended Exposure Assumptions for Use in Deriving Action Levels

[Sections 264.521 (a)(2); (b); (c)(3); and (d)]

1. In deriving action levels for hazardous constituents in ground-water, assume a water intake of 2 liters/day for 70 kg adult/70 year lifetime exposure period.

2. In deriving action levels for hazardous constituents in air, assume air intake of 20 cubic meters/day for 70 kg adult/70 year lifetime exposure period.

3. In deriving action levels for hazardous constituents in soil, which are known or suspected to be carcinogens, assume soil intake of 0.1 gram/day for 70 kg adult/70 year lifetime exposure period.

4. In deriving action levels for hazardous constituents in soil, other than those which are known or suspected to be carcinogens, assume soil intake of 0.2 gram/day for 16 kg child/5 year exposure period (age 1–6).*

5. In deriving action levels for hazardous constituents in surface water designated by the State for use as a drinking water source, assume a water intake of 2 liters/day for 70 kg adult/70 year lifetime exposure period, unless intake of aquatic organisms is also of concern.

*Not to be averaged over a 70-year lifetime.

Appendix E: Examples of Calculations of Action Levels

I. Governing Equations for Calculating Action Levels

A. *Systemic Toxicants*

$C_m = [RfD*W]/[I*A]$

where:

C_m = action level in medium (units are medium-dependent);

RfD = reference dose (mg/kg/day);

W = body weight (kg);

I = intake assumption (units are medium-dependent); and

A = absorption factor [1] (dimensionless).

B. *Carcinogenic Constituents*

$C_m = [R*W*LT]/[CSF*I*A*ED]$

where:

C_m = action level in medium (units are medium-dependent);

R = assumed risk level (dimensionless) (10^{-6} for class A & B; 10^{-5} for class C carcinogens);

W = body weight (kg);

LT = assumed lifetime (years);

CSF = carcinogenic slope factor $(mg/kg/day)^{-1}$;

I = intake assumption (units are medium-dependent);

A = absorption factor (dimensionless); and

ED = exposure duration (years).

[1] Assumed to be 1 for this appendix, based upon the assumption that the human absorption rate will be the same as the rate in the study upon which the RfD or CPF was developed.

II. Example Calculations for Hazardous Constituents in Air

A. *Systemic Toxicants*

Example calculation for 2,4-dinitrophenol:

$C_a = [0.002\ (mg/kg/d)*1000\ (\mu g/mg)*70(kg)]/[20\ (m^3/d)*1] = 7.0\ \mu g/m^3$

where:

C_a = action level in air ($\mu g/m^3$)

RfD = 0.002 mg/kg/day

W = 70 kg adult

I = 20 m^3/day

A = 1

B. *Carcinogenic Constituents*

Example calculation for 1,1,2,2-tetrachloroethane:

$C_a = [10^{-6}*1000\ (\mu g/mg)*70\ (yrs)*70\ (kg)]/[0.20\ (mg/kg/day)^{-1}*20\ (m^3/day)*1*70\ (yrs)] = .175\ \mu g/m$

where:

C_a = action level in air ($\mu g/m^3$)

R = 10^{-6} (1,1,2,2-Tetrachloroethane is a Class C carcinogen)

W = 70 kg adult

LT = 70 year lifetime

CSF = 0.20 $(mg/kg/day)^{-1}$

I = 20 m^3/day

A = 1

ED = 70 year exposure duration

III. Sample Calculation for Hazardous Constituents in Water

A. *Systemic Toxicants*

Sample calculation for toluene:

$C_w = [0.30\ (mg/kg/day)*70\ (kg)]/[2\ (L/day)*1] = 10.5\ mg/L$

where:

C_w = action level in water (mg/L)

RfD = 0.30 mg/kg/day for toluene
W = 70 kg adult
I = 2 L/day
A = 1

B. *Carcinogenic Constituents*

Sample calculation for 1,1,2,2-tetrachloroethane:

$C_w = [10^{-6} * 70\ (kg) * 70\ (yr)]/[0.20\ (mg/kg/day)^{-1} * 2\ (L/day) * 1 * 70\ (yr)] = 1.75E-03$ mg/L

where:
C_w = action level in water (mg/L)
$R = 10^{-6}$ (1,1,2,2-Tetrachloroethane is a Class C carcinogen)
W = 70 kg adult
LT = 70 year lifetime
CSF = 0.20 $(mg/kg/day)^{-1}$
I = 2 L/day
A = 1
ED = 70 year exposure duration

IV. Sample Calculations for Hazardous Constituents in Soils

A. *Systemic Toxicants*

Example calculations for toluene:

$C_s = [0.30\ (mg/kg/day) * 16\ (kg)]/[0.2\ (g/day) * 1 * 0.001\ (kg/g)] = 24.000$ mg/kg

where:
C_s = action level in soil (mg/kg)
RfD = 0.30 mg/kg/day for toluene
W = 16 kg (5 year old child)
I = 0.2 g/day
A = 1

B. *Carcinogenic Constituents*

Sample calculation for 1,1,2,2-tetrachloroethane:

$C_s = [10^{-6} * 70\ (kg) * 70\ (yrs)]/[0.20\ (mg/kg/day)^{-1} * 0.1\ (g/day) * 0.001\ (kg/g) * 1 * 70\ (yrs)] = 35.0$ mg/kg

where:
C_s = action level in soil (mg/kg)
$R = 10^{-6}$ (1,1,2,2-tetrachloroethane is a Class C carcinogen)
W = 70 kg adult
LT = 70 year lifetime
CSF = 0.20 $(mg/kg/day)^{-1}$
I = 0.1 g/day
A = 1
ED = 70 year exposure duration

APPENDIX F—LIST OF CONSTITUENTS SHOWING ACTION LEVEL SOURCE DATA

Constituent name	Class	Noncarcinogenic effects		Carcinogenic effects	
		Oral RfD (mg/kg/d)	Inhalation RfD (mg/kg/d)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
Acetone	D	1.0E−01			
Acetonitrile	D	6.0E−03			
Acetophenone	D	1.0E−01	5.0E−05		
Acrylamide	B2	2.0E−04		4.5E−00	4.5E−00
Acrylonitrile	B1			5.4E−01	2.4E−01
Aldicarb	D	1.3E−03			
Aldrin	B2	3.0E−05		1.7E+01	1.7E+01
Allyl alcohol	D	5.0E−03			
Aluminum phosphide	D	4.0E−04			
Aniline	B2			5.7E−03	
Antimony	D	4.0E−04			
Arsenic	A	1.0E−03			5.0E+01
Asbestos (2)	A				2.3E−
Barium cyanide	D	7.0E−02			
Barium, ionic	D	5.0E−02	1.0E−04		
Benzidine	A	3.0E−03		2.3E+02	2.3E+02
Beryllium	B2	5.0E−03		4.3E−00	8.4E−00
Bis(2-ethylhexyl)phthlate	B2	2.0E−02		1.4E−02	
Bis(chloroethyl)ether	B2			1.1E−00	1.1E−00
Bromodichloromethane	B2	2.0E−02		1.3E−00	
Bromoform	D	2.0E−02			
Bromomethane	D	1.4E−03	8.0E−03		
Butyl benzyl phthalate	C	2.0E−01			
Cadmium	B1	5.0E−04			6.1E−00
Calcium cyanide	D	4.0E−02			
Carbon disulfide	D	1.0E−01			
Carbon tetrachloride	B2	7.0E−04		1.3E−01	1.3E−01
Chloral	D	2.0E−03			
Chlordane	B2	6.0E−05		1.3E−00	1.3E−00
Chlorine cyanide	D	5.0E−02			
Chlorobenzene	D	2.0E−02	5.0E−03		
Chloroform	B2	1.0E−02		6.1E−03	8.1E−02
2-Chlorophenol	D	5.0E−03			
Chromium (VI)	A	5.0E−03			4.1E+01
Copper cyanide	D	5.0E−03			
m-Cresol	D	5.0E−02			
o-Cresol	D	5.0E−02			
p-Cresol	D	5.0E−02			
Cyanide	D	2.0E−02			
Cyanogen	D	4.0E−02			
Cyanogen bromide	D	9.0E−02			
DDD	B2			2.4E−01	
DDE	B2			3.4E−01	
DDT	B2	5.0E−04		3.4E−01	3.4E−01
Dibutyl phthalate	D	1.0E−01			
Dibutylnitrosamine	B2			5.4E−00	5.4E−00
3,3'-Dichlorobenzidine	B2			4.5E−01	
Dichlorodifluoromethane	D	2.0E−01	5.0E−02		
1,2-Dichloroethane	B2			9.1E−02	9.1E−02
1,1-Dichloroethylene	C	9.0E−03		6.0E−01	1.2E−00
2,4-Dichlorophenol	D	3.0E−03			
2,4-Dichlorophenoxyacetic acid	D	1.0E−02			
1,3-Dichloropropene	B2	3.0E−04			
Dieldrin	B2	5.0E−05		1.6E+01	1.6E+0[illegible]
Diethyl phthalate	D	8.0E−01			
Diethylnitrosamine	B2			1.5E+02	1.5E+02

APPENDIX F—LIST OF CONSTITUENTS SHOWING ACTION LEVEL SOURCE DATA—Continued

Constituent name	Class	Noncarcinogenic effects		Carcinogenic effects	
		Oral RfD (mg/kg/d)	Inhalation RfD (mg/kg/d)	Oral slope factor (mg/kg/d)-1	Inhalation slope factor (mg/kg/d)-1
Dimethoate	D	2.0E−02			
Dimethylnitrosamine	B2			5.1E+01	5.1E+01
m-Dinitrobenzene	D	1.0E−04			
2,4-Dinitrophenol	D	2.0E−03			
2,3-Dinitrotoluene (and 2,6-, mixture)	B2			6.8E−01	
1,4-Dioxane	B2			1.1E−02	
Diphenylamine	D	2.5E−02			
1,2-Diphenylhydrazine	B2			8.0E−01	8.0E−01
Disulfoton	D	4.0E−05			
Endosulfan	D	5.0E−05			
Endothall	D	2.0E−02			
Endrin	D	3.0E−04			
Epichlorohydrin	B2	2.0E−03		9.9E−03	4.2E−03
Ethylbenzene	D	1.0E−01			
Ethylene dibromide	B2			8.5E+01	7.6E−01
Formaldehyde	B1				4.5E−02
Formic acid	D	2.0E−00			
Glycidylaldehyde	D	4.0E−04			
Heptachlor	B2	5.0E−04		4.5E−00	4.5E−00
Heptachlor epoxide	B2	1.3E−05		9.1E−00	9.1E−00
Hexachlorodibenzo-p-dioxin	B2			6.2E+03	6.2E+03
Hexachlorobutadiene	C	2.0E−03		7.8E−02	7.8E−02
alpha-Hexachlorocyclohexane	B2			6.3E−00	6.3E−00
beta-Hexachlorocyclohexane	C			1.8E−00	1.8E−00
Hexachlorocyclopentadiene	D	7.0E−03	2.0E−05		
Hexachloroethane	C	1.0E−03		1.4E−02	1.4E−02
Hexachlorophene	D	3.0E−04			
Hydrazine	B2			3.0E−00	1.7E+01
Hydrogen cyanide	D	2.0E−02			
Hydrogen sulfide	D	3.0E−03			
Isobutyl alcohol	D	3.0E−01			
Isophorone	C	2.0E−01		4.1E−03	
Lead	B2				
Lindane (gamma-hexachlorocyclohexane)	B2/C	3.0E−04		1.3E−00	
m-Phenylenediamine	D	6.0E−03			
Maleic anhydride	D	1.0E−01			
Maleic hydrazide	D	6.0E−01			
Mercury (inorganic)	D	3.0E−04			
Methacrylonitrile	D	1.0E−04	2.0E−04		
Methomyl	D	2.5E−02			
Methyl chlorocarbonate	D				
Methyl ethyl ketone	D	5.0E−02	9.0E−02		
Methyl isobutyl ketone	D	5.0E−02	2.0E−02		
Methyl parathion	D	2.5E−04			
Methylene chloride	B	6.0E−02		7.5E−03	1.4E−02
n-Nitroso-di-n-butylamine	B2			5.4E−00	5.4E−00
n-Nitroso-n-ethylurea	B				
n-Nitroso-n-methylethylamine	B2			2.2E+01	
n-Nitrosodi-n-propylamine	B2			7.0E−00	
n-Nitrosodiethanolamine	B2			2.9E−00	
n-Nitrosodiphenylamine	B2			4.9E−03	
n-Nitrosopyrrolidine	B2			2.1E−00	2.1E−00
Nickel	D	2.0E−02			
Nickel refinery dust	A				8.4E−01
Nitric oxide	D	1.0E−01			
Nitrobenzene	D	5.0E−04	6.0E−04		
Nitrogen dioxide	D	1.0E−00			
Osmium tetroxide	D	1.0E−05			
Parathion	C	6.0E−03			
Pentachlorobenzene	D	8.0E−04			
Pentachloronitrobenzene	C	3.0E−03			2.5E−01
Pentachlorophenol	D	3.0E−02			
Phenol	D	6.0E−01			
Phenyl mercuric acetate	D	8.0E−05			
Phosphine	D	3.0E−04			
Phthalic anhydride	D	2.0E−00			
Polychlorinated biphenyls	B2			7.7E−00	
Potassium cyanide	D	5.0E−02			
Potassium silver cyanide	D	2.0E−01			
Pronamide	D	7.5E−02			
Pyridine	D	1.0E−03			
Selenious acid	D	3.0E−03			
Selenourea	D	5.0E−03			
Silver	D	3.0E−03			
Silver cyanide	D	1.0E−01			
Sodium cyanide	D	4.0E−02			

APPENDIX F—LIST OF CONSTITUENTS SHOWING ACTION LEVEL SOURCE DATA—Continued

Constituent name	Class	Noncarcinogenic effects		Carcinogenic effe	
		Oral RFD (mg/kg/d)	Inhalation RFD (mg/kg/d)	Oral slope factor (mg/kg/d)-1	Inhalation slope factor (mg/kg/d) [illegible]
Strychnine	D	3.0E−04			
Styrene	C	2.0E−01			
1,1,1,2-Tetrachloroethane	C	3.0E−02		2.6E−02	2.6E−02
1,2,4,5-Tetrachlorobenzene	D	3.0E−04			
1,1,1,2-Tetrachloroethane	C	3.0E−02		2.6E−02	2.6E−02
1,1,2,2-Tetrachloroethane	C			2.0E−01	2.0E−01
Tetrachloroethylene	B2	1.0E−02		5.1E−02	3.3E−03
2,3,4,6-Tetrachlorophenol	D	3.0E−02			
Tetraethyl lead	D	1.0E−07			
Tetraethyldithiopyrophosphate	D	5.0E−04			
Thallic oxide	D	7.0E−05			
Thallium acetate	D	9.0E−05			
Thallium carbonate	D	8.0E−05			
Thallium chloride	D	8.0E−05			
Thallium nitrate	D	9.0E−05			
Thallium sulfate	D	8.0E−05			
Thiosemicarbazide	D	8.0E−03			
Thiram	D	5.0E−03			
Toluene	D	3.0E−01	2.0E−00		
Toxaphene	B2			1.1E−00	1.1E−00
1,2,4-Trichlorobenzene	D	2.0E−02	3.0E−03		
1,1,1-Trichloroethane	D	9.0E−02	3.0E−01		
1,1,2-Trichloroethane	C	4.0E−03		5.7E−02	5.7E−02
Trichloroethylene	B2			1.1E−02	
Trichloromonofluoromethane	D	3.0E−01	2.0E−01		
2,4,5-Trichlorophenol	D	1.0E−01			
2,4,6-Trichlorophenol	B2			2.0E−02	2.0E−02
2,4,5-Trichlorophenoxyacetic acid	D	1.0E−02			
1,2,3-Trichloropropane	D	6.0E−03			
Vanadium pentoxide	D	9.0E−03			
Xylenes	D	2.0E−00	3.0E−01		
Zinc cyanide	D	5.0E−02			
Zinc phosphide	D	3.0E−04			

For the reasons set out in the preamble, 40 CFR parts 264, 265, 270, and 271 are proposed to be amended as follows:

PART 264—STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

1. The authority citation for part 264 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, and 6925.

2. Section 264.1 is amended by revising paragraphs (d) and (g) introductory text to read as follows:

§ 264.1 Purpose, scope and applicability.

* * * * *

(d) The requirements of this part apply to a person disposing of hazardous waste by means of underground injection subject to a permit issued under an Underground Injection control (UIC) program approved or promulgated under the Safe Drinking Water Act only to the extent they are required by § 144.14 of this chapter and to the extent they are included in a RCRA permit by rule granted to such a person under part 270 of this chapter.

* * * * *

(g) Except as required under subpart S of this part governing releases from solid waste management units, the requirements of this part do not apply to:

* * * * *

§ 264.101 [Removed]

3. In 40 CFR part 264, subpart F, it is proposed to remove § 264.101.

4. In 40 CFR part 264, subpart G, it is proposed to amend § 264.113 by redesignating paragraphs (a)(1)(ii) as (a)(1)(iii) and (b)(1)(ii) as (b)(1)(iii), and by adding new paragraphs (a)(1)(ii) and (b)(1)(ii) to read as follows:

§ 264.113 Closure time allowed for closure.

* * * * *

(a) * * *

(1) * * *

(ii) Corrective action required at the unit or the facility under subpart S will delay the completion of partial or final closure; or

* * * * *

(b) * * *

(1) * * *

(ii) Corrective action required at the unit or the facility under subpart S will delay the completion of partial or final closure; or

* * * * *

5. 40 CFR part 264 is amended by adding subpart S to read as follows:

Subpart S—Corrective Action for Solid Waste Management Units

264.500 Purpose and applicability.
264.501 Definitions.
264.502–264.509 [Reserved].
264.510 Requirement to perform remedial investigations.
264.511 Scope of remedial investigations.
264.512 Plans for remedial investigations.
264.513 Reports of remedial investigations.
264.514 Determination of no further action.
264.515–264.519 [Reserved]
264.520 Requirement to perform corrective measure study.
264.521 Action levels.
264.522 Scope of corrective measure studies.
264.523 Plans for corrective measure studies.
264.524 Reports of corrective measure studies.
264.525 Selection of remedy
264.526 Permit modification for remedy.
264.527 Remedy design.
264.528 Progress reports.
264.529 Review of remedy implementation.
264.530 Completion of remedies.

APPENDIX D

DRMO Storage Shed - Analytical Data

(Source: Reference 5, 7)

TABLE 9

EVALUATION OF SOIL CONTAMINATION
DEFENSE REUTILIZATION & MARKETING OFFICE STORAGE
mg/kg
(ppm)

	pH	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	NICKEL	SELENIUM	SILVER
THRESHOLD	6.5 4.3	51.29	2.00	1.25	26.51	146.92	1.00	10.11	0.20	1.00
SAMPLE										
A-1	8.6 x	152.00 x	0.30	5.06 x	11.90	272.00 x	0.020	32.00 x	0.20	2.86 x
A-2	9.1 x	27.30	0.30	1.56 x	3.41	31.20	0.020	6.83	0.20	0.50
A-3	9.2 x	61.70 x	0.30	4.42 x	6.31	209.00 x	0.029	12.10 x	0.20	0.50
A-4	10.1 x	54.40 x	0.30	3.16 x	8.26	331.00 x	0.214	24.30 x	0.20	0.97
A-5	9.3 x	21.00	0.30	1.91 x	3.81	34.30	0.197	7.15	0.20	0.50
A-6	8.1 x	34.60	0.30	5.09 x	7.68	343.00 x	0.235	15.80 x	0.20	0.50
A-7	8.5 x	67.30 x	0.30	2.10 x	9.54	242.00 x	0.256	13.40 x	0.20	0.50
A-8	8.5 x	20.40	0.30	1.00	4.27	34.70	0.211	5.22	0.20	0.50
A-9	8.5 x	28.80	0.30	1.07	5.85	122.00	0.079	6.34	0.20	3.38 x
B-1	9.2 x	133.00 x	0.30	6.04 x	10.60	113.00	0.181	38.60 x	0.20	2.88 x
B-2	8.7 x	153.00 x	0.30	5.76 x	11.50	405.00 x	0.202	38.40 x	0.20	0.99
B-3	9.1 x	202.00 x	0.30	6.42 x	30.30 x	1114.00 x	0.204	35.80 x	0.20	0.50
B-4	8.6 x	51.40 x	0.30	4.51 x	15.40	739.00 x	0.219	23.50 x	0.20	1.00
B-5	8.5 x	64.30 x	0.30	6.58 x	28.40 x	1515.00 x	0.216	48.30 x	0.20	1.00
B-6	8.5 x	78.80 x	0.30	5.80 x	81.30 x	1041.00 x	0.187	68.40 x	0.20	0.50
B-7	8.4 x	49.60	0.30	1.57 x	10.80	191.00 x	0.187	8.84	0.20	0.98
B-8	8.6 x	64.30 x	0.30	2.16 x	10.30	208.00 x	0.196	12.30 x	0.20	0.50
B-9	8.4 x	12.30	0.30	0.54	4.94	35.50	0.228	7.40	0.20	0.50
C-3	8.6 x	34.00	0.30	1.31 x	5.82	172.00 x	0.189	11.20 x	0.20	0.95
C-4	8.4 x	46.60	0.30	2.23 x	12.40	384.00 x	0.112	10.00	0.20	0.50
C-5	9.0 x	57.20 x	0.30	2.70 x	34.90 x	371.00 x	0.106	19.50 x	0.20	1.00
C-6	9.1 x	56.30 x	0.30	2.64 x	15.90	647.00 x	0.081	15.90 x	0.20	0.50
C-7	10.2	48.40	0.30	2.56 x	10.10	254.00 x	0.070	17.80 x	0.20	0.50
C-8	8.0 x	41.90	0.30	3.35 x	20.90	460.00 x	0.188	22.50 x	0.20	2.34 x
C-9	8.4 x	129.00 x	0.30	5.40 x	12.20	275.00 x	0.084	41.30 x	0.20	2.44 x
C-1	8.9 x	98.50 x	0.44	5.12 x	15.60	349.00 x	0.044	38.00 x	0.20	2.48 x
C-2	8.7 x	108.00 x	0.30	4.67 x	12.90	601.00 x	0.045	38.20 x	0.20	0.50

TABLE 9 (CONTINUED)

mg/kg
(ppm)

	pH	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	NICKEL	SELENIUM	SILVER
THRESHOLD	6.5	51.29	2.00	1.25	26.51	146.92	1.00	10.11	0.20	1.00
	4.3									
SAMPLE										
D-1	8.8 X	130.00 X	0.30	5.48 X	22.70	410.00 X	0.104	43.40 X	0.20	1.97 X
D-2	9.0 X	182.00 X	0.30	4.87 X	13.40	486.00 X	0.059	34.80 X	0.20	2.48 X
D-3	8.4 X	54.80 X	0.30	3.24 X	19.90	643.00 X	0.213	26.40 X	0.20	0.50
D-4	8.2 X	61.60 X	0.30	3.67 X	26.30	3460.00 X	7.620 X	29.30 X	0.20	0.50
D-5	9.3 X	32.30	0.30	1.64 X	10.40	61.10	0.133	8.44	0.20	0.50
D-6	9.0 X	33.80	0.30	2.53 X	5.96	172.00 X	0.103	68.00 X	0.20	0.99
D-7	8.7 X	21.50	0.30	1.05	4.99	26.40	0.057	5.99	0.20	0.50
D-8	8.6 X	17.90	0.30	0.99	4.97	9.45	0.046	5.47	0.20	0.50
D-9	8.8 X	71.70 X	0.30	4.73 X	8.96	149.00 X	0.054	27.40 X	0.20	1.49 X
E-1	8.2 X	130.00 X	0.53	4.85 X	16.50	482.00 X	0.280	2270.00 X	0.20	4.37 X
E-2	8.3 X	121.00 X	0.30	3.95 X	10.10	271.00 X	0.121	20.70 X	0.20	1.44 X
E-3	9.0 X	43.60	0.30	2.11 X	10.30	333.00 X	0.227	12.70 X	0.20	0.98
E-4	8.5 X	38.40	0.30	1.90 X	5.69	345.00 X	0.531	7.11	0.20	0.95
E-5	8.6 X	39.00	0.30	2.25 X	4.50	75.50	0.547	8.00	0.20	0.50
E-6	9.6 X	27.40	0.30	1.78 X	4.81	156.00 X	0.101	6.26	0.20	0.50
E-7	8.6 X	18.70	0.30	1.68 X	11.80	256.00 X	0.065	13.30 X	0.20	0.50
E-8	7.9 X	50.30	0.30	3.34 X	436.00 X	1421.00 X	0.193	25.40 X	0.20	1.00
E-9	8.6 X	178.00 X	0.30	4.90 X	9.72	96.20	0.058	32.80 X	0.20	2.31 X
ST-1	8.8 X	4880.00 X	0.30	4.23 X	38.90 X	1879.00 X	0.163	46.20 X	0.20	0.50
ST-2	8.6 X	39.80	0.30	3.01 X	20.90	680.00 X	0.067	22.80 X	0.20	0.97
ST-3	7.7 X	79.80 X	0.30	3.88 X	89.80 X	2612.00 X	0.035	29.60 X	0.20	0.91
ST-4	8.1 X	79.40 X	0.30	4.34 X	26.00	864.00 X	0.095	32.40 X	0.20	1.00
ST-5	8.7 X	40.00	0.30	4.23 X	15.90	914.00 X	0.093	23.60 X	0.20	0.91
ST-6	8.1 X	74.4 X	0.30	6.52 X	99.9 X	4362 X	0.257	34.7 X	0.20	0.91
ST-7	8.7 X	35.4	0.30	2.08 X	10.7	200 X	0.054	13.6 X	0.20	0.5
ST-8	8.3 X	43.6	0.30	2.34 X	9.84	283 X	0.106	17.8 X	0.20	0.94

SOUTHERN DIVISION NAVAL FACILITIES

DELIVERY ORDER # 0097

DRMO STORAGE SHED SOIL SAMPLES

CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm) pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
170	A-1-1	3/28	8.1	14.1	<0.1	-	8.78	-	3.05	<0.5
171	A-1-2	3/28	8.1	92.8	<0.1	-	10.3	-	21.0	1.29
172	A-1-3	3/28	7.8	22.8	<0.1	-	9.40	-	1.79	<0.5
173	A-2-1	3/28	7.9	-	<0.1	-	-	-	-	-
174	A-2-2	3/28	8.3	-	<0.1	-	-	-	-	-
175	A-2-3	3/28	8.1	-	<0.1	-	-	-	-	-
176	A-3-1	3/28	5.5	1.75	<0.1	-	12.3	-	<1.0	-
177	A-3-2	3/28	7.5	15.4	<0.1	-	12.6	-	<1.0	-
178	A-3-3	3/28	8.1	36.2	<0.1	-	17.9	-	20.9	-
179	A-4-1	3/28	6.4	3.07	<0.1	-	11.0	-	<1.0	-
180	A-4-2	3/28	8.2	25.0	2.36	-	24.5	-	5.35	-
181	A-4-3	3/28	7.8	10.6	<0.1	-	17.4	-	3.67	-
182	A-5-1	3/28	4.3	-	<0.1	-	-	-	-	-
183	A-5-2	3/28	8.2	-	<0.1	-	-	-	-	-
184	A-5-3	3/28	7.8	-	1.86	-	-	-	-	-
185	A-6-1	3/28	4.8	-	<0.1	-	<2.5	-	<1.0	-
186	A-6-2	3/28	8.1	-	<0.1	-	8.67	-	2.89	-
187	A-6-3	3/28	8.0	-	<0.1	-	13.3	-	12.3	-
188	A-7-1	3/28	5.1	10.0	<0.1	-	6.97	-	<1.0	-
189	A-7-2	3/28	8.1	10.9	<0.1	-	8.18	-	2.34	-
190	A-7-3	3/28	7.9	60.0	<0.1	-	13.7	-	17.0	-
191	A-8-1	3/28	4.9	-	-	-	-	-	-	-
192	A-8-2	3/28	8.4	-	-	-	-	-	-	-
193	A-8-3	3/28	8.4	-	-	-	-	-	-	-
194	A-9-1	3/28	5.9	-	-	-	-	-	-	<0.5
195	A-9-2	3/28	8.3	-	-	-	-	-	-	<0.5
196	A-9-3	3/28	8.0	-	-	-	-	-	-	<0.5
197	B-1-1	3/28	8.3	12.0	<0.1	-	-	-	3.98	<0.5
198	B-1-2	3/28	8.3	7.93	<0.1	-	-	-	<1.0	<0.5
199	B-1-3	3/28	8.2	16.9	<0.1	-	-	-	7.19	<0.5
200	B-2-1	3/28	7.4	<1.5	<0.1	-	7.45	-	<1.0	-
201	B-2-2	3/28	8.2	16.5	<0.1	-	10.8	-	7.06	-
202	B-2-3	3/28	8.3	68.0	<0.1	-	17.5	-	16.1	-
203	B-3-1	3/28	7.1	<1.5	<0.1	6.03	<2.5	-	<1.0	-
204	B-3-2	3/28	7.4	6.38	<0.1	16.9	15.5	-	<1.0	-
205	B-3-3	3/28	7.2	68.0	<0.1	35.8	14.5	-	20.4	-
206	B-4-1	3/28	5.2	<1.5	<0.1	-	9.60	-	<1.0	-
207	B-4-2	3/28	8.0	21.1	<0.1	-	11.8	-	9.31	-
208	B-4-3	3/28	8.1	52.2	<0.1	-	17.0	-	16.5	-
209	B-5-1	3/28	5.4	4.36	<0.1	2.54	4.72	-	<1.0	-
210	B-5-2	3/28	7.9	11.7	<0.1	15.0	11.2	-	7.01	-
211	B-5-3	3/28	8.3	55.5	<0.1	25.0	15.5	-	15.5	-

SOUTHERN DIVISION NAVAL FACILITIES

DELIVERY ORDER # 0097

DRMO STORAGE SHED SOIL SAMPLES

CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm)							
			pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
300	E-8-2	3/29	8.0	-	<0.1	32.7	10.6	-	18.9	-
301	E-8-3	3/29	7.6	-	<0.1	14.3	15.2	-	10.1	-
302	E-9-1	3/29	7.5	5.99	<0.1	-	-	-	<1.0	<0.5
303	E-9-2	3/29	7.7	30.6	<0.1	-	-	-	11.6	<0.5
304	E-9-3	3/29	7.3	10.2	<0.1	-	-	-	<1.0	<0.5
305	ST-1-1	3/30	4.5	<1.5	<0.1	2.46	<2.5	-	<1.0	-
306	ST-1-2	3/30	7.8	9.99	<0.1	4.76	<2.5	-	<1.0	-
307	ST-1-3	3/30	7.9	35.6	<0.1	35.6	14.4	-	24.4	-
308	ST-2-1	3/30	6.8	-	<0.1	-	<2.5	-	<1.0	-
309	ST-2-2	3/30	8.0	-	<0.1	-	<2.5	-	<1.0	-
310	ST-2-3	3/30	8.0	-	<0.1	-	13.2	-	11.7	-
311	ST-3-1	3/30	4.7	7.97	<0.1	1.49	<2.5	-	<1.0	-
312	ST-3-2	3/30	8.5	<1.5	<0.1	6.98	7.48	-	<1.0	-
313	ST-3-3	3/30	8.3	35.0	<0.1	17.5	9.99	-	6.99	-
314	ST-4-1	3/30	7.5	9.04	<0.1	-	34.3	-	1.90	-
315	ST-4-2	3/30	7.5	7.98	<0.1	-	19.5	-	3.99	-
316	ST-4-3	3/30	7.8	14.4	<0.1	-	60.0	-	4.46	-
317	ST-5-1	3/30	4.9	-	<0.1	-	5.97	-	<1.0	-
318	ST-5-2	3/30	8.5	-	<0.1	-	12.5	-	<1.0	-
319	ST-5-3	3/30	8.2	-	<0.1	-	14.0	-	19.0	-
320	ST-6-1	3/30	7.3	<1.5	<0.1	3.50	<2.5	-	<1.0	-
321	ST-6-2	3/30	8.3	13.6	<0.1	11.2	<2.5	-	1.46	-
322	ST-6-3	3/30	8.4	10.5	<0.1	6.50	<2.5	-	<1.0	-
323	ST-7-1	3/30	5.2	-	<0.1	-	<2.5	-	<1.0	-
324	ST-7-2	3/30	8.1	-	<0.1	-	9.24	-	8.26	-
325	ST-7-3	3/30	8.1	-	<0.1	-	11.9	-	11.4	-
326	ST-8-1	3/30	5.5	-	<0.1	-	<2.5	-	<1.0	-
327	ST-8-2	3/30	8.2	-	<0.1	-	6.46	-	<1.0	-
328	ST-8-3	3/30	7.9	-	<0.1	-	12.8	-	14.3	-

SOUTHERN DIVISION NAVAL FACILITIES

DELIVERY ORDER # 0097

DRMO STORAGE SHED SOIL SAMPLES

CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm)							
			pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
255	D-2-2	3/29	8.5	9.81	<0.1	-	10.8	-	3.43	<0.5
256	D-2-3	3/29	8.3	43.9	<0.1	-	18.5	-	23.4	<0.5
257	D-3-1	3/29	8.2	11.6	<0.1	-	11.6	-	3.38	-
258	D-3-2	3/29	8.2	10.3	<0.1	-	11.8	-	15.2	-
259	D-3-3	3/29	8.3	35.2	<0.1	-	17.3	-	14.9	-
260	D-4-1	3/29	5.7	<1.5	<0.1	-	14.9	<0.02	<1.0	-
261	D-4-2	3/29	8.3	<1.5	<0.1	-	7.81	<0.02	<1.0	-
262	D-4-3	3/29	8.3	36.6	<0.1	-	13.1	<0.02	18.3	-
263	D-5-1	3/29	5.8	-	<0.1	-	-	-	-	-
264	D-5-2	3/29	8.3	-	<0.1	-	-	-	-	-
265	D-5-3	3/29	8.1	-	<0.1	-	-	-	-	-
266	D-6-1	3/29	8.0	-	<0.1	-	<2.5	-	<1.0	-
267	D-6-2	3/29	8.3	-	<0.1	-	<2.5	-	<1.0	-
268	D-6-3	3/29	8.1	-	<0.1	-	12.9	-	11.3	-
269	D-7-1	3/29	6.6	-	-	-	-	-	-	-
270	D-7-2	3/29	8.0	-	-	-	-	-	-	-
271	D-7-3	3/29	8.2	-	-	-	-	-	-	-
272	D-8-1	3/29	7.0	-	-	-	-	-	-	-
273	D-8-2	3/29	8.3	-	-	-	-	-	-	-
274	D-8-3	3/29	8.2	-	-	-	-	-	-	-
275	D-9-1	3/29	7.8	10.2	<0.1	-	12.1	-	3.88	<0.5
276	D-9-2	3/29	8.2	27.8	<0.1	-	60.4	-	15.1	<0.5
277	D-9-3	3/29	8.2	17.2	<0.1	-	15.8	-	3.82	<0.5
278	E-1-1	3/29	8.5	19.8	<0.1	-	20.3	-	6.45	<0.5
279	E-1-2	3/29	8.4	22.9	<0.1	-	11.9	-	14.8	<0.5
280	E-1-3	3/29	8.6	54.3	<0.1	-	20.7	-	21.7	<0.5
281	E-2-1	3/29	8.4	19.5	<0.1	-	73.6	-	8.54	<0.5
282	E-2-2	3/29	8.3	15.4	<0.1	-	8.85	-	3.72	<0.5
283	E-2-3	3/29	8.2	26.9	<0.1	-	10.0	-	8.69	<0.5
284	E-3-1	3/29	8.1	-	<0.1	-	5.65	-	2.83	-
285	E-3-2	3/29	8.0	-	<0.1	-	7.37	-	2.95	-
286	E-3-3	3/29	8.3	-	<0.1	-	6.04	-	3.25	-
287	E-4-1	3/29	8.3	-	<0.1	-	49.1	-	-	-
288	E-4-2	3/29	7.8	-	<0.1	-	10.7	-	-	-
289	E-4-3	3/29	7.9	-	<0.1	-	10.5	-	-	-
290	E-5-1	3/29	8.3	-	<0.1	-	-	-	-	-
291	E-5-2	3/29	8.3	-	<0.1	-	-	-	-	-
292	E-5-3	3/29	8.1	-	<0.1	-	-	-	-	-
293	E-6-1	3/29	6.9	-	<0.1	-	6.65	-	-	-
294	E-6-2	3/29	8.1	-	<0.1	-	8.39	-	-	-
295	E-6-3	3/29	7.7	-	<0.1	-	12.1	-	-	-
296	E-7-1	3/29	7.6	-	<0.1	-	5.84	-	<1.0	-
297	E-7-2	3/29	8.0	-	<0.1	-	15.0	-	27.3	-
298	E-7-3	3/29	7.4	-	<0.1	-	10.6	-	2.75	-
299	E-8-1	3/29	6.8	-	<0.1	2.31	<2.5	-	<1.0	-

SOUTHERN DIVISION NAVAL FACILITIES

DELIVERY ORDER # 0097

DRMO STORAGE SHED SOIL SAMPLES

CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm) pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
212	B-6-1	3/28	5.7	<1.5	<0.1	3.34	8.35	-	<1.0	-
213	B-6-2	3/28	8.2	33.9	<0.1	26.3	16.7	-	10.0	-
214	B-6-3	3/28	8.4	74.9	<0.1	26.0	15.6	-	16.8	-
215	B-7-1	3/28	7.2	-	2.46	-	11.4	-	-	-
216	B-7-2	3/28	8.3	-	<0.1	-	9.61	-	-	-
217	B-7-3	3/28	8.2	-	<0.1	-	13.1	-	-	-
218	B-8-1	3/28	5.9	<1.5	<0.1	-	6.81	-	<1.0	-
219	B-8-2	3/28	8.0	11.7	0.72	-	8.13	-	<1.0	-
220	B-8-3	3/28	7.8	68.4	<0.1	-	11.9	-	14.2	-
221	B-9-1	3/28	5.5	-	-	-	-	-	-	-
222	B-9-2	3/28	8.0	-	-	-	-	-	-	-
223	B-9-3	3/28	8.1	-	-	-	-	-	-	-
224	C-1-1	3/28	8.5	10.2	<0.1	-	8.80	-	1.35	<0.5
225	C-1-2	3/28	8.6	26.9	<0.1	-	11.0	-	9.96	<0.5
226	C-1-3	3/28	8.4	62.8	<0.1	-	12.8	-	18.8	<0.5
227	C-2-1	3/28	7.3	7.15	<0.1	-	7.80	-	<1.0	-
228	C-2-2	3/28	8.4	15.3	<0.1	-	13.4	-	1.91	-
229	C-2-3	3/28	7.7	20.7	<0.1	-	21.1	-	2.07	-
230	C-3-1	3/28	7.1	-	3.25	-	<2.5	-	1.39	-
231	C-3-2	3/28	7.5	-	<0.1	-	12.5	-	1.69	-
232	C-3-3	3/28	7.9	-	<0.1	-	10.1	-	22.0	-
233	C-4-1	3/28	4.5	-	<0.1	-	<2.5	-	-	-
234	C-4-2	3/28	7.9	-	0.52	-	8.24	-	-	-
235	C-4-3	3/28	7.7	-	<0.1	-	11.7	-	-	-
236	C-5-1	3/29	5.2	<1.5	3.65	3.08	<2.5	-	<1.0	-
237	C-5-2	3/29	8.2	53.4	<0.1	31.9	9.88	-	16.6	-
238	C-5-3	3/29	8.1	78.5	<0.1	33.4	9.54	-	18.0	-
239	C-6-1	3/29	4.9	<1.5	<0.1	-	<2.5	-	1.45	-
240	C-6-2	3/29	8.4	8.31	<0.1	-	8.31	-	2.19	-
241	C-6-3	3/29	8.1	51.4	<0.1	-	17.4	-	15.2	-
242	C-7-1	3/29	5.3	-	<0.1	-	<2.5	-	<1.0	-
243	C-7-2	3/29	8.1	-	<0.1	-	21.1	-	13.0	-
244	C-7-3	3/29	8.1	-	<0.1	-	19.3	-	18.4	-
245	C-8-1	3/29	5.1	-	0.43	-	8.66	-	1.44	<0.5
246	C-8-2	3/29	8.0	-	<0.1	-	9.02	-	3.61	<0.5
247	C-8-3	3/29	8.3	-	<0.1	-	18.6	-	17.6	<0.5
248	C-9-1	3/29	8.1	12.8	<0.1	-	<2.5	-	1.56	<0.5
249	C-9-2	3/29	8.3	27.5	<0.1	-	14.7	-	15.6	<0.5
250	C-9-3	3/29	8.1	14.9	<0.1	-	11.2	-	9.33	<0.5
251	D-1-1	3/29	8.6	12.1	<0.1	-	12.6	-	5.80	<0.5
252	D-1-2	3/29	8.3	16.2	<0.1	-	12.3	-	2.45	<0.5
253	D-1-3	3/29	8.3	23.8	<0.1	-	15.3	-	18.8	<0.5
254	D-2-1	3/29	8.1	7.48	<0.1	-	9.97	-	2.99	<0.5

[illegible]
[illegible] GRITTY SOIL
[illegible] DETECTION LIMITS

	METHOD DETECTION LIMIT (ppm)
[illegible]-PYRIDINE	1.0
ANILINE	2.5
[illegible]-CHLOROPHENOL	1.0
FORMALDEHYDE	1.0
PYRIDINE	1.0
CRESOL (TOTAL)	1.0

	METHOD DETECTION LIMIT (ppb)
METHYLENE CHLORIDE	5.0
CHLOROFORM	5.0
1,1,1-TRICHLOROETHANE	5.0
CARBON TETRACHLORIDE	5.0
1,2-DICHLOROETHANE	5.0
TRICHLOROETHYLENE	5.0
TETRACHLOROETHYLENE	5.0
TOLUENE	5.0
DICHLOROFLUOROMETHANE	5.0
TRICHLOROFLUOROMETHANE	5.0
DIETHYL ETHER	5.0
METHYL ETHYL KETONE	5.0
METHYL ISOBUTYL KETONE	5.0
ETHYLENE OXIDE	5.0

[illegible]
[illegible] NUMBER [illegible] - [illegible] STORAGE [illegible]
SOIL SAMPLES

SAMPLE ID	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SAMPLE DATE	[illegible]	[illegible]	[illegible]	10/05 87	[illegible]	[illegible]	[illegible]	10/05 87	[illegible]
(as rec'd ppb)									
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
[illegible]	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	11.2	BDL	75.8	BDL	57.6	BDL	BDL	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
IDLE BY ORDER NUMBER [illegible] - DRUM STORAGE AREA
SOIL SAMPLES

SAMPLE ID	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9
SAMPLE DATE	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87
(as received ppb)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	15.3	42.3	BDL	15.2	BDL	6.3	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER [illegible] - DEMO STORAGE SHED
SOIL SAMPLES

SAMPLE ID	C-9	C-8	C-7	C-6	C-5	C-4	C-3	C-2	C-1
SAMPLE DATE	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87	10/05/87
Was received ppm									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Was received ppb									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	50.5	7.7	BDL	BDL	BDL	BDL	8.2	9.7	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER [illegible] - DFSC STORAGE SITE
SOIL SAMPLES

SAMPLE ID	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9
SAMPLE DATE	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87
(as received ppm)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	6.3	16.3	48.9	5.9	24.1	24.1	17.9	BDL	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER [illegible] - DRMO STORAGE AREA
SOIL SAMPLES

SAMPLE ID	E-4	E-6	E-7	E-8	E-5	E-4	E-3	E-2	E-1
SAMPLE DATE	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87
(as received ppm)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	BDL	BDL	13.4	17.9	26.6	BDL	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
TELL BAY ORDER NUMBER [illegible] - DRMO STORAGE AREA
SOIL SAMPLES

SAMPLE ID	ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8
SAMPLE DATE	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87	10/06/87
(as received ppm)								
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)								
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	8.1	BDL	BDL	29.6	BDL	BDL	BDL	7.4
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER [illegible]
MATRIX SPIKE RESULTS

	A-9					C-8					D-5				
	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC
(as received ppm)															
HYDRAZINE	BDL	67.4	67.4	40.7	47	BDL	67.4	67.4	26.8	40	BDL	67.4	67.4	47.8	71
PYRIDINE	BDL	72.4	72.4	31.7	44	BDL	72.4	72.4	15.3	21	BDL	72.4	72.4	64.6	89
O-CRESOL	BDL	35.2	35.2	38.7	110	BDL	35.2	35.2	19.9	56	BDL	35.2	35.2	27.8	79
(as received ppb)															
METHYLENE CHLORIDE	BDL	9.9	9.9	4.3	44	BDL	9.9	9.9	4.4	42	BDL	6.6	6.6	2.9	44
CHLOROFORM	BDL	11.2	11.2	4.9	44	BDL	11.2	11.2	4.9	44	BDL	7.5	7.5	3.6	48
1,1,1-TRICHLOROETHANE	BDL	10.0	10.0	2.1	21	BDL	10.0	10.0	2.6	26	BDL	6.7	6.7	2.4	34
CARBON TETRACHLORIDE	BDL	12.0	12.0	3.1	26	BDL	12.0	12.0	2.3	20	BDL	8.0	8.0	3.3	41
1,2-DICHLOROETHANE	BDL	9.2	9.2	5.9	64	BDL	9.2	9.2	6.2	67	BDL	6.3	6.3	5.1	81
TRICHLOROETHYLENE	BDL	11.0	11.0	3.8	35	BDL	11.0	11.0	3.9	36	BDL	6.7	6.7	2.3	34
TETRACHLOROETHYLENE	BDL	12.2	12.2	4.2	35	BDL	12.2	12.2	4.5	37	BDL	8.1	8.1	2.9	36
TOLUENE	BDL	12.9	12.9	7.0	54	BDL	12.9	12.9	6.9	54	BDL	8.6	8.6	4.2	49
DIETHYL ETHER	BDL	141	141	108	77	BDL	141	141	86.9	61	BDL	48.6	48.6	35.5	73
METHYL ETHYL KETONE	BDL	160	160	**	**	BDL	160	160	158	98	BDL	40.0	40.0	18.6	47
METHYL ISOBUTYL KETONE	BDL	160	160	123	77	BDL	160	160	110	69	BDL	40.0	40.0	41.6	104

	E-1					ST-8				
	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC
(as received ppm)										
HYDRAZINE	BDL	67.4	67.4	59.9	57	BDL	67.4	67.4	31.7	47
PYRIDINE	BDL	72.4	72.4	38.6	53	BDL	72.4	72.4	14.3	20
O-CRESOL	BDL	35.2	35.2	22.4	64	BDL	35.2	35.2	14.4	41
(as received ppb)										
METHYLENE CHLORIDE	BDL	6.6	6.6	5.0	76	BDL	6.6	6.6	4.1	62
CHLOROFORM	BDL	7.5	7.5	6.6	88	BDL	7.5	7.5	5.2	69
1,1,1-TRICHLOROETHANE	BDL	6.7	6.7	3.7	55	BDL	6.7	6.7	3.2	48
CARBON TETRACHLORIDE	BDL	8.0	8.0	3.4	43	BDL	8.0	8.0	3.1	40
1,2-DICHLOROETHANE	BDL	6.3	6.3	4.7	75	BDL	6.3	6.3	4.8	76
TRICHLOROETHYLENE	BDL	6.7	6.7	4.3	70	BDL	6.7	6.7	3.8	57
TETRACHLOROETHYLENE	BDL	8.1	8.1	5.2	64	BDL	8.1	8.1	3.1	39
TOLUENE	BDL	8.6	8.6	4.7	55	BDL	8.6	8.6	4.1	48
DIETHYL ETHER	BDL	141	141	110	78	7.2	141	148	101	68
METHYL ETHYL KETONE	BDL	35.0	35.0	33.0	96	BDL	160	160	109	68
METHYL ISOBUTYL KETONE	BDL	160	160	158	99	BDL	160	160	118	74

SPK - SPIKE
EXP - EXPECTED
FND - FOUND
% REC - % RECOVERY
BDL - BELOW DETECTION LIMIT
** - NOT DETECTED DUE TO MATRIX INTERFERENCE

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER 0057
DUPLICATE RESULTS SUMMARY

	A-9			C-8			D-8			E-1			ST-8		
	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP
(as received ppm)															
2-AMINOPYRIDINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
HYDRAZINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
PENTACHLOROPHENOL	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
FORMALDEHYDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
PYRIDINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CRESOL (TOTAL)	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
(as received ppb)															
METHYLENE CHLORIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CHLOROFORM	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
1,1,1-TRICHLOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CARBON TETRACHLORIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
1,2-DICHLOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROETHYLENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TETRACHLOROETHYLENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TOLUENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
DICHLOROFLUOROMETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROFLUOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROFLUOROMETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
DIETHYL ETHER	BDL	BDL	100	7.7	6.0	80	BDL	BDL	100	BDL	BDL	100	7.4	6.9	93
METHYL ETHYL KETONE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
METHYL ISOBUTYL KETONE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
ETHYLENE OXIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100

1ST = ORIGINAL SAMPLE
2ND = DUPLICATE

APPENDIX E

Pesticide Mixing Area - Analytical Data

(Source: Reference 12)

pH MEASUREMENTS OF WATER SAMPLES
COLLECTED FROM MONITOR WELLS AT THE
PESTICIDE-MIXING AREA,
FEBRUARY 12, 1982[1]

Well Number	pH
WPA-1	6.02
WPA-2	6.04

[1] Measured at the time of sample collection.

ENERGY RESOURCES CO. INC

INORGANIC ANALYSIS

- Report Sheet -
- µg/l

Analyzed for: Geraghty & Miller
Sediments - waters

ERCO ID	CLIENT ID	As
IC-82-		
	Waters	µg/l
576	WPA-1	<10
577	WPA-2	<10
577 ERCO	DUPLICATE	<10

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID#.

Sample Rcvd. 2/17/82 Reported by Lee

Date Analysis Completed 3/16/82 Checked by [illegible]

ENERGY RESOURCES CO. INC

INORGANIC ANALYSIS

- Report Sheet -
µg/gm dry wgt.

Analyzed for: Geraghty & Miller
Sediments

ERCO ID	CLIENT ID	As
IC-82		
554	PA-1	6.3
555	PA-2	2.8
556	PA-3	3.9
556	ERCO DUPLICATE	3.0
557	PA-4	1.1
558	PA-5	2.9
559	PA-6	4.2
560	PA-7	5.7
561	PA-8	4.8

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID#.

Sample Rcvd. 2/17/82 Reported by Lau

Date Analysis Completed 3/16/82 Checked by MGL

ENERGY RESOURCES CO. INC.

HERBICIDE ANALYSES

ERCO ID	G&M ID	2,4-D (µg/l) Det. Limit	2,4-D (µg/l) Conc.	2,4,5-TP (µg/l) Det. Limit	2,4,5-TP (µg/l) Conc.
28-552	WPA-1	0.05	ND	0.02	ND
28-553	WPA-2	0.05	ND	0.02	ND
28-554	PA-1	5.0	ND	1.5	ND
28-555	PA-2	5.0	ND	1.5	ND
28-556	PA-3	5.0	ND	1.5	ND
28-557	PA-4	5.0	ND	1.5	ND
28-558	PA-5	5.0	ND	1.5	ND
28-559	Soil Blank	5.0	ND	1.5	ND
28-560	PA-7	5.0	ND	1.5	ND
28-561	PA-8	5.0	ND	1.5	ND
28-562	PA-9	5.0	ND	1.5	ND

ND = none detected

Reported by: George Perry

Checked by: ADW

Date Analysis Completed: 3/25/82

Analyzed for: Client ID

Compounds	WPA-1	WPA-2	PA-1	PA-2	PA-3	PA-4	PA-5	blank	PA-6	PA-7	PA-8
	28-552	28-553	28-554	28-555	28-556	28-557	28-558	28-559	28-560	28-561	28-561
1. 89P aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2. 90P dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3. 91P chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4. 92P 4,4'-DDT	ND	ND	100	40	880	7	6	ND	20	200	4
5. 93P 4,4'-DDE	ND	ND	230	40	350	4	7	ND	15	250	3
6. 94P 4,4'-DDD	ND	ND	11	7	150	ND	ND	ND	1	18	ND
7. 95P α-endosulfan	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8. 96P β-endosulfan	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9. 97P endosulfan sulfate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10. 98P endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11. 99P endrin aldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12. 100P heptachlor	ND	ND	ND	ND	2	ND	ND	ND	ND	1.0	ND
13. 101P heptachlor epoxide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14. 102P α-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15. 103P β-BHC	ND	ND	ND	ND	1	ND	ND	ND	ND	1	ND
16. 104P γ-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17. 105P δ-BHC	ND	ND	ND	ND	2	ND	ND	ND	ND	1	ND
18. 106P PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19. 107P PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20. 108P PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21. 109P PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22. 110P PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23. 111P PCB-1260	ND	ND	39	ND	100	2	2	ND	7	36	1
24. 112P PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
25. 113P toxaphene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Reported by: Elle

ENVIRONMENTAL
SCIENCE
CORPORATION

P.O. BOX 616
NUT STREET • MIDDLETOWN, CONN. 06457
TELEPHONE: 347-6961

Laboratory Report

LAB REPORT NO
C-0440

State Certification No. PH-04

CLIENT

Commanding Officer
Southern Division
Naval Facilities Command
2144 Melbourne Street
P.O. Box 10068
Charleston, S.C. 29411

DATE May 17, 1982

CLIENT PHONE NO (803) 743-5510

SPECIAL INSTRUCTIONS

0004

SAMPLE DESCRIPTION	TEST	RESULTS	
Pesticide Mixing Area 2" Sample #1	D,P DDT	5.3	µg/ml (ppm)
	P,P DDT	<0.01	µg/gr (ppm)
	DDT total	5.3	µg/ml
	2,4 D	<0.01	µg/gr (ppm)
	2,4,5 TP (Silvex)	0.51	µg/gr (ppm)
Pesticide Mixing Area 2" Sample #2	D,D DDT	0.08	µg/gr
	P,P DDT	1.4	µg/gr
	Total DDT	1.48	µg/gr (ppm)
	2,4 D	0.09	µg/gr (ppm)
	2,4,5 TP (Silvex)	<0.01	µg/gr (ppm)

ANALYSES OF SOIL SAMPLES COLLECTED BY NAVAL PERSONNEL, May 1982.

REMARKS

APPENDIX F

Public Works Storage Yard - Analytical Data

Prior to Partial Closure

Analytical Data - March 28, 1986

Note: Background samples were collected from each of three residential areas within the Naval Shipyard itself. Those samples (labeled BK1, BK2, BK3) were collected from:

* near officers quarters EE, at the intersection of Avenue G and Second Street West;

* near officers quarters Y/Z, at the intersection of Hobson Avenue and Pine Street; and

* near the tennis courts (NS48, 49) adjacent to enlisted quarters at the intersection of Partridge Avenue, Osprey Street and East Avenue.

Source: EnSafe. July 11, 1986. Evaluation of Soil Contamination at the Interim Status Storage Facility 'Old Corral'.

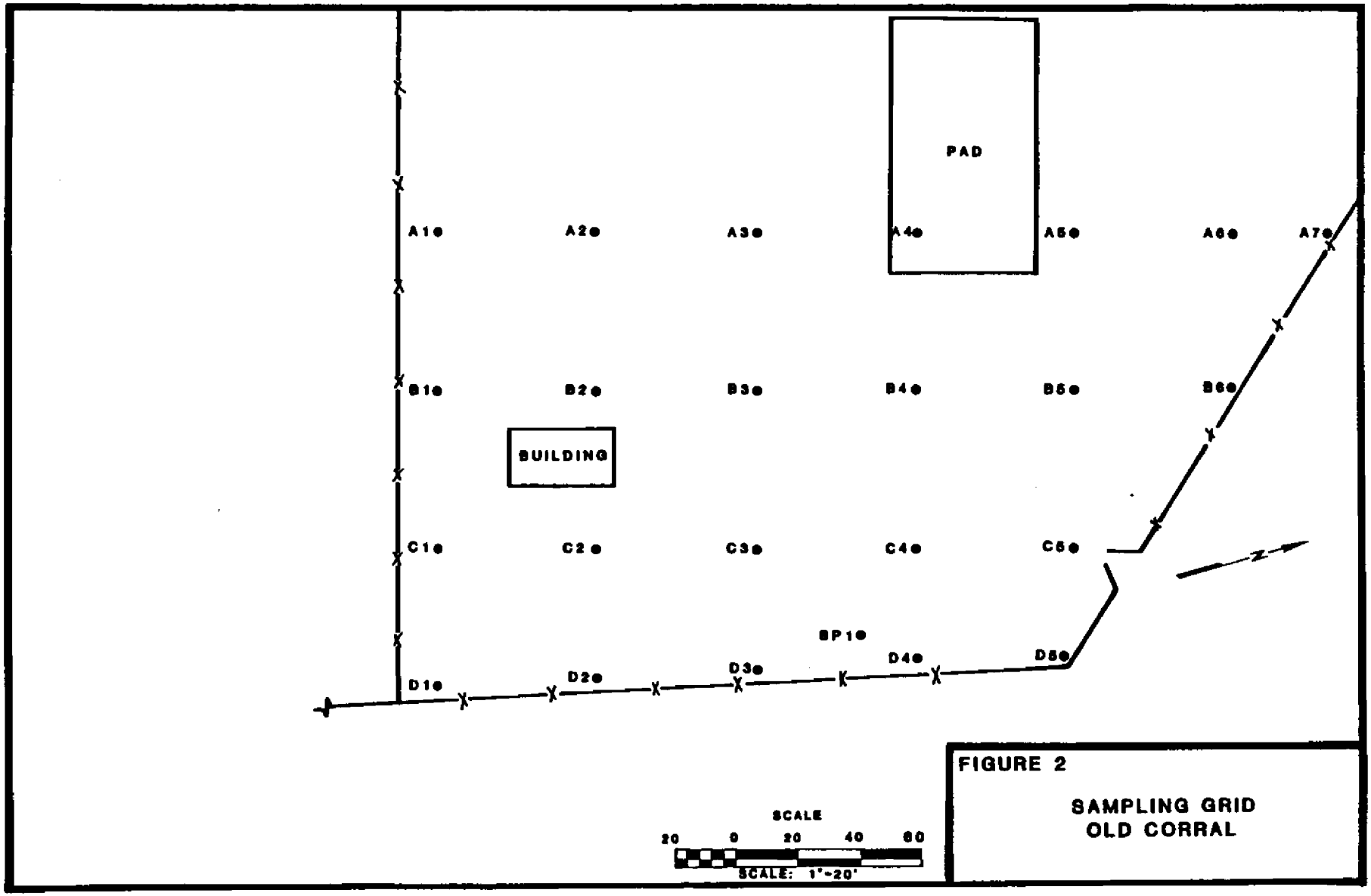

FIGURE 2

SAMPLING GRID
OLD CORRAL

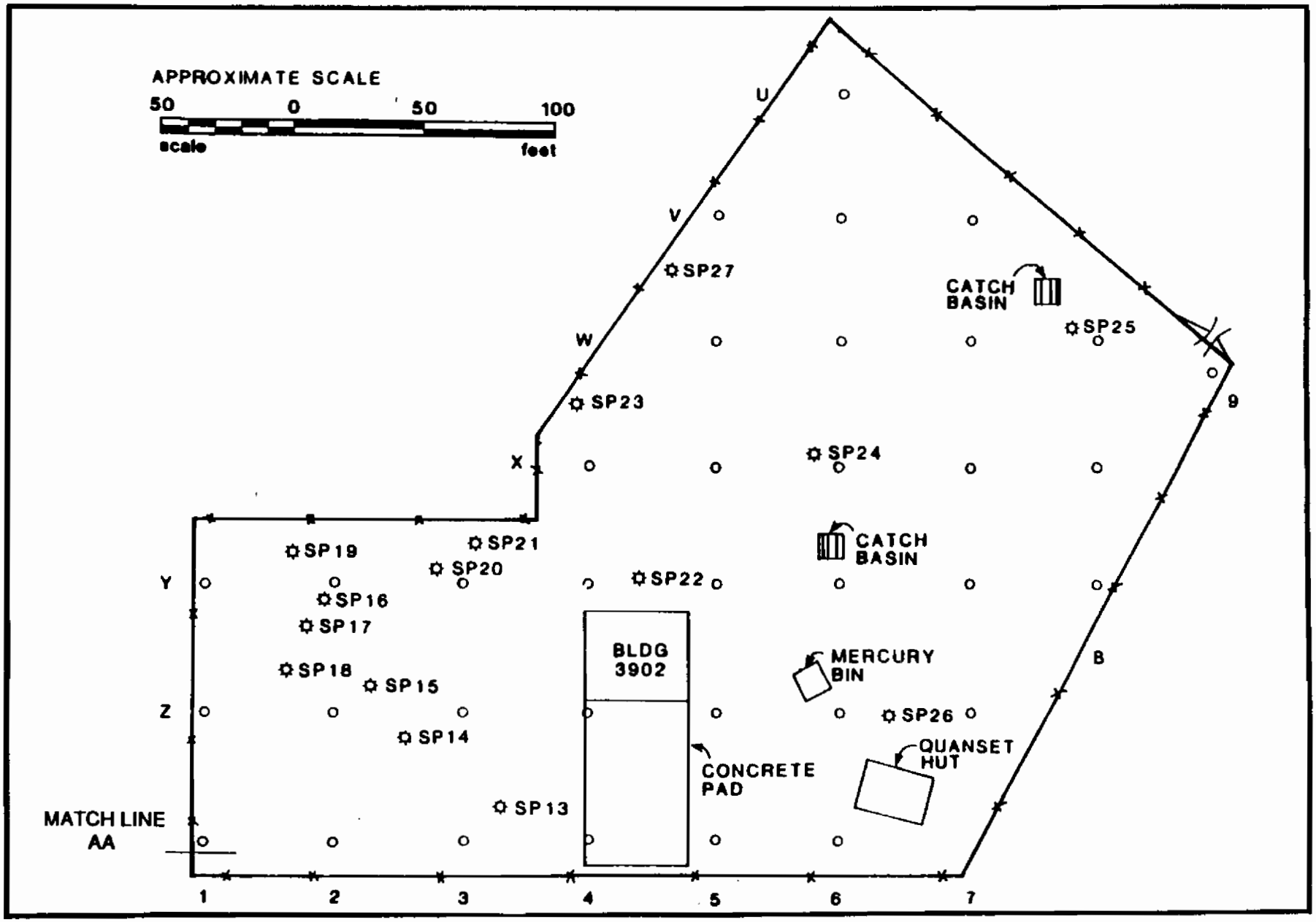

Figure 2-16. Sampling stations, public works storage yard. (Figure taken from Reference 5.)

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GENERAL ENGINEERING LABORATORIES

1313 Ashley River Road
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Charleston, S.C. 29417
Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	BK1	BK2	BK3
	LAB ID :	86030866	86030867	86030868
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86
PH - LAB		4.88 § 25C	5.30 § 25C	5.99 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		31.9 ppm	16.3 ppm	11.2 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		0.71 ppm	0.59 ppm	0.93 ppm
CHROMIUM		8.08 ppm	3.90 ppm	15.6 ppm
[illegible]		119 ppm	28.8 ppm	20.9 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		2.88 ppm	2.49 ppm	6.35 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm
[illegible]LOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm

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CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

PARAMETER	SAMPLE ID :	BK1	BK2	BK3
	LAB ID :	86030866	86030867	86030868
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/08/86

RELEASED BY: GEORGE C. GREENE PE, PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	A1	A2	A3	A4
	LAB ID :	86030831	86030832	86030833	86030834
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		6.90 § 24C	3.55 § 24C	7.70 § 24C	7.30 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		2.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		31.8 ppm	63.0 ppm	24.5 ppm	29.6 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		2.52 ppm	4.17 ppm	1.76 ppm	2.38 ppm
CHROMIUM		16.0 ppm	22.7 ppm	16.3 ppm	14.6 ppm
LEAD		112 ppm	180 ppm	141 ppm	91.6 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		12.5 ppm	11.1 ppm	7.46 ppm	5.24 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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DATE: 04/08/86

	SAMPLE ID :	A1	A2	A3	A4
	LAB ID :	86030831	86030832	86030833	86030834
PARAMETER	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	117 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/08/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	A5	A6	A7	B1
	LAB ID :	86030835	86030836	86030837	86030838
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		6.40 § 24C	7.60 § 24C	7.50 § 24C	8.10 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		26.7 ppm	18.3 ppm	18.7 ppm	52.2 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		2.02 ppm	1.60 ppm	2.39 ppm	1.88 ppm
CHROMIUM		12.2 ppm	25.0 ppm	24.1 ppm	10.0 ppm
LEAD		33.0 ppm	101 ppm	71.5 ppm	51.1 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		5.26 ppm	7.14 ppm	12.6 ppm	6.54 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184

DATE: 04/08/86

CONTACT: MR. J. SPEAKMAN, PhD, PE

PARAMETER	SAMPLE ID :	A5	A6	A7	B1
	LAB ID :	86030835	86030836	86030837	86030838
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		34.2 ppm	9.1 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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DATE: 04/08/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	B2	B3	B4	B5
	LAB ID :	86030839	86030840	86030841	86030842
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		5.95 § 26C	7.39 § 25C	7.70 § 24C	7.90 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		170 ppm	10.0 ppm	31.7 ppm	15.8 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		2.04 ppm	1.14 ppm	1.79 ppm	1.82 ppm
CHROMIUM		14.5 ppm	8.0 ppm	14.0 ppm	19.5 ppm
LEAD		232 ppm	156 ppm	94.2 ppm	69.9 ppm
RCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
KEL		11.3 ppm	3.82 ppm	5.25 ppm	5.78 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		8.4 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		16.2 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
CLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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CONTACT: MR. J. SPEAKMAN, PhD, PE

	SAMPLE ID :	B2	B3	B4	B5
	LAB ID :	86030839	86030840	86030841	86030842
PARAMETER	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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DATE: 04/08/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	B6	C1	C2	C3
	LAB ID :	86030843	86030844	86030845	86030846
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		7.00 § 26C	6.61 § 24C	6.40 § 24C	7.50 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		17.0 ppm	142 ppm	380 ppm	14.1 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		2.72 ppm	2.88 ppm	1.16 ppm	<0.20 ppm
CHROMIUM		37.5 ppm	19.8 ppm	63.1 ppm	9.42 ppm
LEAD		141 ppm	331 ppm	508 ppm	62.5 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		9.72 ppm	16.2 ppm	5.12 ppm	3.92 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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PARAMETER	SAMPLE ID :	B6	C1	C2	C3
	LAB ID :	86030843	86030844	86030845	86030846
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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Chemical Analysis

Laboratory Certification Number 10120

CLIENT: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86
RELEASED BY: GEORGE C. GREENE PE, PHD

CLIENT CODE: ENSA

SAMPLE ID :	C4	C5	D1	D2
LAB ID :	86030847	86030848	86030849	86030850
PARAMETER DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB	7.20 § 24C	7.70 § 26C	6.80 § 26C	7.20 § 26C
FLASH POINT, c.c.	>140 F	>140 F	>140 F	>140 F
CYANIDE	<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES	<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM	13.8 ppm	22.5 ppm	23.5 ppm	55.3 ppm
BERYLLIUM	<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM	1.54 ppm	1.24 ppm	1.81 ppm	3.46 ppm
CHROMIUM	3.09 ppm	23.8 ppm	16.8 ppm	31.2 ppm
LEAD	96.8 ppm	131 ppm	75.1 ppm	180 ppm
MERCURY	1.6 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL	3.68 ppm	9.58 ppm	8.62 ppm	15.0 ppm
SELENIUM	<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER	<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL	<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL	<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM	<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLORDFLUOROMETHANE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER	<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE	<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016	<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221	<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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DATE: 04/10/86

CONTACT: MR. J. SPEAKMAN, PhD, PE

PARAMETER	SAMPLE ID :	C4	C5	D1	D2
	LAB ID :	86030847	86030848	86030849	86030850
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	2.0 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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P.O. BOX 341315
MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

RELEASED BY: GEORGE C. GREENE BE,PHD

CLIENT CODE: ENSA

	SAMPLE ID :	D3	D4	D5	SP1
	LAB ID :	86030851	86030852	86030853	86030854
PARAMETER	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		7.00 § 24C	6.88 § 24C	6.11 § 24C	7.10 § 25C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		31.9 ppm	24.8 ppm	26.7 ppm	13.5 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		2.78 ppm	8.70 ppm	3.10 ppm	2.23 ppm
CHROMIUM		70.3 ppm	38.3 ppm	31.8 ppm	24.0 ppm
LEAD		162 ppm	90.6 ppm	81.0 ppm	126 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		13.8 ppm	15.4 ppm	12.4 ppm	14.0 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

	SAMPLE ID :	D3	D4	D5	SP1
	LAB ID :	86030851	86030852	86030853	86030854
PARAMETER	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	3.3 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	SP2	SP3	SP4	SP5
	LAB ID :	86030855	86030856	86030857	86030858
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		6.20 § 24C	7.50 § 24C	7.70 § 24C	7.30 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		13.5 ppm	22.7 ppm	57.2 ppm	35.0 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		0.56 ppm	0.91 ppm	1.63 ppm	1.28 ppm
CHROMIUM		8.00 ppm	21.9 ppm	18.3 ppm	17.8 ppm
LEAD		7.39 ppm	2400 ppm	506 ppm	369 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		4.19 ppm	4.27 ppm	8.10 ppm	6.73 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		6.2 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		3.5 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184

DATE: 04/10/86

CONTACT: MR. J. SPEAKMAN, PhD, PE

PARAMETER	SAMPLE ID :	SP2	SP3	SP4	SP5
	LAB ID :	86030855	86030856	86030857	86030858
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		2.9 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm	1.7 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184
CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	SP6	SP7	SP8	SP9
	LAB ID :	86030859	86030860	86030861	86030862
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
PH - LAB		7.10 § 24C	7.35 § 24C	8.28 § 25C	8.30 § 25C
FLASH POINT, c.c.		>140 F	>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		56.2 ppm	41.7 ppm	50.1 ppm	12.9 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		1.57 ppm	0.92 ppm	1.16 ppm	0.72 ppm
'HROMIUM		19.7 ppm	32.0 ppm	18.2 ppm	10.6 ppm
ÀD		323 ppm	774 ppm	293 ppm	77.6 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		9.33 ppm	4.10 ppm	11.5 ppm	2.39 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
'RIDINE		<1 ppm	<1 ppm	<1 ppm	<1 ppm
JCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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DATE: 04/10/86

	SAMPLE ID :	SP6	SP7	SP8	SP9
	LAB ID :	86030859	86030860	86030861	86030862
PARAMETER	DATE RECEIVED:	03/28/86	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	1.9 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm	<0.5 ppm

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CONTACT: MR. J. SPEAKMAN, PhD, PE

DATE: 04/10/86
RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	SP10	SP11	SP12
	LAB ID :	86030863	86030864	86030865
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86
PH - LAB		8.20 § 24C	8.18 § 24C	7.40 § 24C
FLASH POINT, c.c.		>140 F	>140 F	>140 F
CYANIDE		<1.0 ppm	<1.0 ppm	<1.0 ppm
SULFIDES		<1.0 ppm	<1.0 ppm	<1.0 ppm
BARIUM		30.7 ppm	33.9 ppm	20.4 ppm
BERYLLIUM		<2.0 ppm	<2.0 ppm	<2.0 ppm
CADMIUM		1.30 ppm	3.69 ppm	1.32 ppm
CHROMIUM		18.0 ppm	18.3 ppm	14.3 ppm
LEAD		82.1 ppm	737 ppm	222 ppm
MERCURY		<1.0 ppm	<1.0 ppm	<1.0 ppm
NICKEL		7.29 ppm	7.98 ppm	6.87 ppm
SELENIUM		<0.2 ppm	<0.2 ppm	<0.2 ppm
SILVER		<1.0 ppm	<1.0 ppm	<1.0 ppm
CRESOL		<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<1 ppm	<1 ppm	<1 ppm
CARBON TETRACHLORIDE		<1 ppm	<1 ppm	<1 ppm
CHLOROFORM		<1 ppm	<1 ppm	<1 ppm
DICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm
ETHYLENE DICHLORIDE		<1 ppm	<1 ppm	<1 ppm
METHYL ETHYL KETONE		<1 ppm	<1 ppm	<1 ppm
METHYL ISOBUTYL KETONE		<1 ppm	<1 ppm	<1 ppm
METHYLENE CHLORIDE		<1 ppm	<1 ppm	<1 ppm
TETRACHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm
TOLUENE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHANE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROETHYLENE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROETHANE		<1 ppm	<1 ppm	<1 ppm
TRICHLOROFLUOROMETHANE		<1 ppm	<1 ppm	<1 ppm
AMINO PYRIDINE		<1 ppm	<1 ppm	<1 ppm
DIETHYL ETHER		<1 ppm	<1 ppm	<1 ppm
ETHYLENE OXIDE		<1 ppm	<1 ppm	<1 ppm
FORMALDEHYDE		<1 ppm	<1 ppm	<1 ppm
HYDRAZINE		<1 ppm	<1 ppm	<1 ppm
PYRIDINE		<1 ppm	<1 ppm	<1 ppm
AROCLOR 1016		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm	<0.5 ppm

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MEMPHIS , TN 38184

DATE: 04/10/86

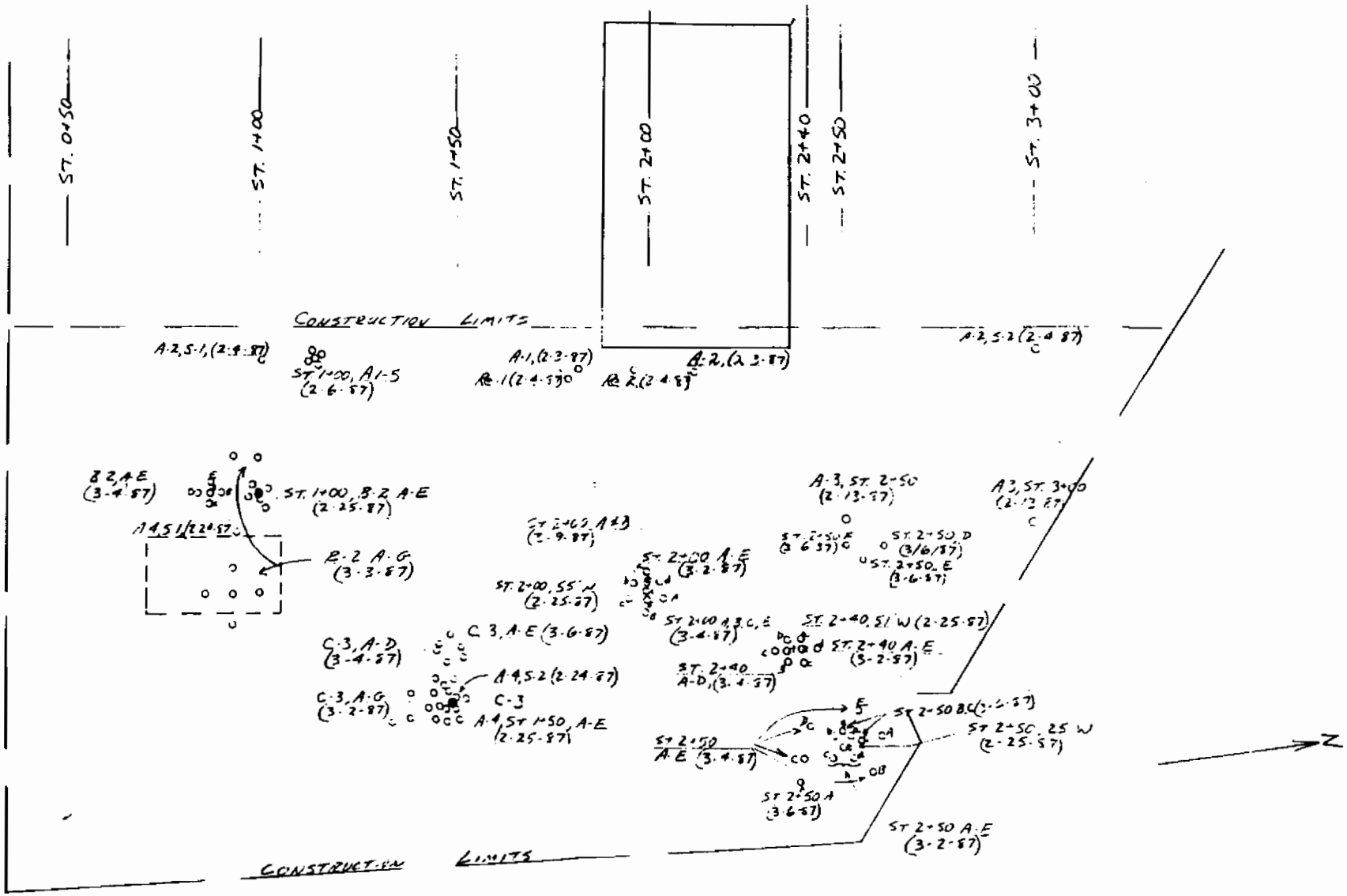
CONTACT: MR. J. SPEAKMAN, PhD, PE

PARAMETER	SAMPLE ID :	SP10	SP11	SP12
	LAB ID :	86030863	86030864	86030865
	DATE RECEIVED:	03/28/86	03/28/86	03/28/86
AROCLOR 1232		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm	<0.5 ppm

Subsequent to Partial Closure

Completed 1986

Cold Storage Warehouse (Building #193)



GENERAL ENGINEERING LABORATORIES	DRAWN BY ALBRIGHT	CHECKED BY	CLIENT CODE	DATE
engineering consulting & chemical analysis	REV NO / DATE	CHECKED BY	PROJECT SAMPLE SITE HAZARDOUS WASTE STORAGE YARD CHARLESTON NAVAL SHIPYARD	DRAWIN 1

1313 Ashley River Rd.
Charleston, S.C. 29407
(803) 556-8171

DEPARTMENT OF THE NAVY
CHARLESTON NAVAL SHIPYARD
NAVAL BASE
CHARLESTON, S. C. 29408

S
4/2
1142

IN REPLY REFER TO

5090
Ser 461/172
30 MAR 1987

Mr. David C. Price, P.E.
South Carolina Department of Health
and Environmental Control
Bureau of Solid and Hazardous Waste
2600 Bull Street
Columbia, SC 29201

RE: Charleston Naval Shipyard
Charleston County
EPA ID #SC0170022560

Dear Mr. Price:

Partial closure of the Public Works storage yard has been completed. Attached are two copies of the certification document for your review.

Construction of a cold storage warehouse addition is scheduled to begin on April 6, 1987 on this site. Therefore, we request an expedient response of concurrence from your department so no government delays will be incurred.

If you have any questions, contact John Sneed or Alan Shoultz at (803) 743-5519.

Sincerely,

D. H. HINES
Captain, USN
Commander,
Charleston Naval Shipyard

Encl:
(1) Closure Certification (2)

Copy to:
Commanding Officer,
Southern Division
Naval Facilities Engineering Command (Code 114)

CLOSURE CERTIFICATION

FOR
PARTIAL CLOSURE OF THE
HAZARDOUS WASTE STORAGE YARD
CHARLESTON NAVAL SHIPYARD
CHARLESTON, SOUTH CAROLINA

I certify that I have personally reviewed the following plans for closure of the Hazardous Waste Storage Yard at the Charleston Naval Shipyard in Charleston, South Carolina.

Charleston Naval Shipyard Charleston, SC Closure Plans Interim Status Facilities, dated May 27, 1986 and approved by the South Carolina Department of Health and Environmental Control in a letter from Mr. David Price to Mr. J.W. Sneed, dated October 22, 1986;

Section 02099 of Navy Plans and Specifications for Construction Contract No. 06-86-0589 entitled Hazardous Waste Storage Yard Partial Closure Plan.

On March 20, 1987 I had a telephone conversation with Mr. Mark Taylor of the Southern Division Naval Facilities Engineering Command concerning the above referenced closure plans. During that conversation, Mr. Taylor informed me of the established contaminant threshold limits which had been approved by the South Carolina Department of Health and Environmental Control.

Samples were collected on February 3, 4, 6, 13, 24, 25, 1987 and March 2, 3, 4, 6, 9, 1987 by General Engineering Laboratories field personnel in accordance with the approved plans. The sample locations are indicated in Drawing No. 1. These samples were analyzed by General Engineering Laboratories analytical personnel in accordance with the approved plans. The results of the analyses are attached herewith.

Based on my review of the sampling procedures, comparison of the analytical data with established threshold limits, and conversations with field technicians, I certify that partial closure of the Hazardous Waste Storage Yard has been accomplished in accordance with the above referenced closure plans and specifications.

Date: 3/23/87

Engineer: _____
George C. Greene, P.E., Ph.D.
SC Reg. No. 9103

Owner: _____
D. H. Hines, Capt, USN
Commander

fc: aewc032087

gineering Consulting
mical Analysis

GENERAL ENGINEERING LABORATORIES

1313 Ashley River Road
Charleston, S.C. 29407

P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 02/06/87
RELEASED BY: for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	A-1	A-2
	LAB ID :	87020117	87020118
	DATE RECEIVED:	02/03/87	02/03/87
BARIUM		34.8 ppm	23.6 ppm
CADMIUM		0.38 ppm	0.20 ppm
CHROMIUM		6.73 ppm	9.33 ppm
LEAD		15.6 ppm	19.6 ppm
ACID DIGESTION		YES	YES
CRESOL		<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/06/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
Dr. GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 2 SAMPLE #1	AREA 2 SAMPLE #2
	LAB ID :	87020163	87020164
	DATE RECEIVED:	02/04/87	02/04/87
BARIUM		16.0 ppm	17.4 ppm
CADMIUM		0.40 ppm	0.79 ppm
CHROMIUM		24.5 ppm	18.7 ppm
LEAD		483 ppm	50.6 ppm
ACID DIGESTION		YES	YES
CRESOL		<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/09/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

	SAMPLE ID :	STA. 100 AREA 1 6"	STA. 100 AREA 2 6"	STA. 100 AREA 3 6"	STA. 100 AREA 4 6"
	LAB ID :	87020240	87020241	87020242	87020243
PARAMETER	DATE RECEIVED:	02/06/87	02/06/87	02/06/87	02/06/87
BARIUM		22.9 ppm	48.6 ppm	14.9 ppm	9.80 ppm
CADMIUM		<0.20 ppm	<0.20 ppm	0.53 ppm	<0.20 ppm
CHROMIUM		8.44 ppm	3.33 ppm	3.36 ppm	4.67 ppm
LEAD		26.2 ppm	50.2 ppm	28.5 ppm	21.6 ppm
ACID DIGESTION		YES	YES	YES	YES
CRESOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm	<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 02/09/87

RELEASED BY: for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID : STA. 100 AREA 5 18"	LAB ID : 87020244	DATE RECEIVED: 02/06/87
BARIUM	21.9 ppm		
CADMIUM	0.27 ppm		
CHROMIUM	8.04 ppm		
LEAD	40.2 ppm		
ACID DIGESTION	YES		
CRESOL	<1.0 ppm		
PENTACHLOROPHENOL	<1.0 ppm		
AROCLOR 1016	<1 ppm		
AROCLOR 1221	<1 ppm		
AROCLOR 1232	<1 ppm		
AROCLOR 1242	<1 ppm		
AROCLOR 1248	<1 ppm		
AROCLOR 1254	<1 ppm		
AROCLOR 1260	<1 ppm		
AROCLOR 1262	<1 ppm		
EXTRACTION & CONCENTRATION	YES		

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/13/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: W. Byron Jones
for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 3 ST-2+50 50' EAST	AREA 3 ST-3+00 50' EAST
	LAB ID :	87020481	87020482
	DATE RECEIVED:	02/13/87	02/13/87
BARIUM		20.0 ppm	16.3 ppm
CADMIUM		0.73 ppm	1.17 ppm
CHROMIUM		14.0 ppm	17.8 ppm
LEAD		66.9 ppm	36.0 ppm
ACID DIGESTION		YES	YES
CRESOL		<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES

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Laboratory Certification Number 10120

CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/25/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 4 SAMPLE 1	AREA 4 SAMPLE 2
	LAB ID :	87020824	87020825
	DATE RECEIVED:	02/24/87	02/24/87
BARIUM		18.9 ppm	7.17 ppm
CADMIUM		0.72 ppm	0.54 ppm
CHROMIUM		32.0 ppm	26.0 ppm
LEAD		304 ppm	168 ppm
CRESOL		<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 02/27/87

RELEASED BY: for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 4 ST-1+50 C-3-A 18"	AREA 4 ST-1+50 C-3-B 6"	AREA 4 ST-1+50 C-3-C 6"	AREA 4 ST-1+50 C-3-D 6"
	LAB ID :	87020953	87020954	87020955	87020956
	DATE RECEIVED:	02/25/87	02/25/87	02/25/87	02/25/87
BARIUM		23.3 ppm	13.9 ppm	14.5 ppm	23.9 ppm
CADMIUM		1.18 ppm	0.44 ppm	0.21 ppm	3.35 ppm
CHROMIUM		18.8 ppm	19.1 ppm	<1.00 ppm	21.4 ppm
LEAD		49.6 ppm	134 ppm	159 ppm	537 ppm
ACID DIGESTION		YES	YES	YES	YES
CRESOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm	<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/27/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 4 ST-1+50 C-3-E 6"	AREA 4 ST-1+00 B-2-A 18"	AREA 4 ST-1+00 B-2-B 6"	AREA 4 ST-1+00 B-2-C 6"
	LAB ID :	87020957	87020958	87020959	87020960
	DATE RECEIVED:	02/25/87	02/25/87	02/25/87	02/25/87
BARIUM		8.46 ppm	49.4 ppm	15.4 ppm	64.9 ppm
CADMIUM		0.35 ppm	1.07 ppm	0.74 ppm	0.87 ppm
CHROMIUM		17.3 ppm	24.5 ppm	24.7 ppm	27.7 ppm
LEAD		128 ppm	374 ppm	123 ppm	172 ppm
ACID DIGESTION		YES	YES	YES	YES
CRESOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	< 1 ppm	<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm	<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 02/27/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G. M. Greene
for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	AREA 4 ST-1+00 B-2-D 6"	AREA 4 ST-1+00 B-2-E 6"	AREA 5 ST-2+40 51' WEST	AREA 5 ST-2+00 55' WEST
	LAB ID :	87020961	87020962	87020963	87020964
	DATE RECEIVED:	02/25/87	02/25/87	02/25/87	02/25/87
BARIUM		95.4 ppm	61.4 ppm	25.8 ppm	27.6 ppm
CADMIUM		1.33 ppm	0.38 ppm	0.89 ppm	1.60 ppm
CHROMIUM		5.45 ppm	9.36 ppm	87.4 ppm	25.2 ppm
LEAD		198 ppm	65.6 ppm	130 ppm	93.6 ppm
ACID DIGESTION		YES	YES	YES	YES
CRESOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
PENTACHLOROPHENOL		<1.0 ppm	<1.0 ppm	<1.0 ppm	<1.0 ppm
AROCLOR 1016		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1221		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1232		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1242		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1248		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1254		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1260		<1 ppm	<1 ppm	<1 ppm	<1 ppm
AROCLOR 1262		<1 ppm	<1 ppm	<1 ppm	<1 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

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OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 02/27/87

RELEASED BY: G.M. Graw
for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID : AREA 4 ST-2+50 25' WEST LAB ID : 87020965 DATE RECEIVED: 02/25/87
BARIUM	38.1 ppm
CADMIUM	2.15 ppm
CHROMIUM	25.0 ppm
LEAD	149 ppm
ACID DIGESTION	YES
CRESOL	<1.0 ppm
PENTACHLOROPHENOL	<1.0 ppm
AROCLOR 1016	<1 ppm
AROCLOR 1221	<1 ppm
AROCLOR 1232	<1 ppm
AROCLOR 1242	<1 ppm
AROCLOR 1248	<1 ppm
AROCLOR 1254	<1 ppm
AROCLOR 1260	<1 ppm
AROCLOR 1262	<1 ppm
EXTRACTION & CONCENTRATION	YES

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1824 SO. 20th STREET
OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 03/03/87

RELEASED BY: for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	C-3 A	C-3 B	C-3 C	C-3 D
	LAB ID :	87030026	87030027	87030028	87030029
PARAMETER	DATE RECEIVED:	03/02/87	03/02/87	03/02/87	03/02/87
CADMIUM		0.71 ppm	0.20 ppm	0.89 ppm	<0.20 ppm
LEAD		199 ppm	648 ppm	215 ppm	112 ppm
ACID DIGESTION		YES	YES	YES	YES

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OMAHA , NE 68106

DATE: 03/03/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A M Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	C-3 E	C-3 F	C-3 G	SITE 250 A
	LAB ID :	87030030	87030031	87030032	87030033
PARAMETER	DATE RECEIVED:	03/02/87	03/02/87	03/02/87	03/02/87
CADMIUM					1.30 ppm
LEAD		686 ppm	103 ppm	76.2 ppm	126 ppm
ACID DIGESTION		YES	YES	YES	YES

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OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 03/03/87

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	SITE 250 B	SITE 250 C	SITE 250 D	SITE 250 E
	LAB ID :	87030034	87030035	87030036	87030037
PARAMETER	DATE RECEIVED:	03/02/87	03/02/87	03/02/87	03/02/87
CADMIUM		1.18 ppm	3.70 ppm	1.32 ppm	<0.20 ppm
LEAD		61.0 ppm	254 ppm	66.4 ppm	<1.00 ppm
ACID DIGESTION		YES	YES	YES	YES

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OMAHA , NE 68106

DATE: 03/03/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A M Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC1

PARAMETER	SAMPLE ID :	ST. 200 A	ST. 200 B	ST. 200 C	ST. 200 D
	LAB ID :	87030038	87030039	87030040	87030041
	DATE RECEIVED:	03/02/87	03/02/87	03/02/87	03/02/87
CADMIUM		0.38 ppm	1.11 ppm	2.28 ppm	0.35 ppm
ACID DIGESTION		YES	YES	YES	YES

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Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/03/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	ST. 200 E	ST. 240 A	ST. 240 B	ST. 240 C
	LAB ID :	87030042	87030043	87030044	87030045
PARAMETER	DATE RECEIVED:	03/02/87	03/02/87	03/02/87	03/02/87
CADMIUM		0.96 ppm			
CHROMIUM			26.5 ppm	27.4 ppm	13.4 ppm
ACID DIGESTION		YES	YES	YES	YES

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Charleston, S.C. 29417
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Chemical Analysis

Laboratory Certification Number 10120

CLIENT: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

DATE: 04/09/86

CONTACT: MR. J. SPEAKMAN, PhD, PE

RELEASED BY: GEORGE C. GREENE PE,PHD

CLIENT CODE: ENSA

PARAMETER	SAMPLE ID :	PCB1	PCB2
	LAB ID :	86030869	86030870
	DATE RECEIVED:	03/28/86	03/28/86
AROCLOR 1016		<0.5 ppm	<0.5 ppm
AROCLOR 1221		<0.5 ppm	<0.5 ppm
AROCLOR 1232		<0.5 ppm	<0.5 ppm
AROCLOR 1242		<0.5 ppm	<0.5 ppm
AROCLOR 1248		<0.5 ppm	<0.5 ppm
AROCLOR 1254		<0.5 ppm	<0.5 ppm
AROCLOR 1260		<0.5 ppm	<0.5 ppm
AROCLOR 1262		<0.5 ppm	<0.5 ppm

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/03/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	ST. 240 D	ST. 240 E
	LAB ID :	87030046	87030047
PARAMETER	DATE RECEIVED:	03/02/87	03/02/87
CHROMIUM		22.2 ppm	12.6 ppm
ACID DIGESTION		YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/04/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A M Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	B-2 A	B-2 B	B-2 C	B-2 D
	LAB ID :	87030048	87030049	87030050	87030051
PARAMETER	DATE RECEIVED:	03/03/87	03/03/87	03/03/87	03/03/87
BARIUM		13.2 ppm	43.0 ppm		
CADMIUM		0.38 ppm	2.96 ppm		
CHROMIUM		3.58 ppm	10.6 ppm		
LEAD		85.8 ppm	119 ppm	120 ppm	120 ppm
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/04/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Crane
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

PARAMETER	SAMPLE ID :	B-2 E	B-2 F	B-2 G
	LAB ID :	87030052	87030053	87030054
	DATE RECEIVED:	03/03/87	03/03/87	03/03/87
LEAD		16.9 ppm	19.0 ppm	73.1 ppm
ACID DIGESTION		YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

PARAMETER	SAMPLE ID :	B-2 A	B-2 B	B-2 C	B-2 D
		03/04/87	03/04/87	03/04/87	03/04/87
	LAB ID :	87030156	87030157	87030158	87030159
	DATE RECEIVED:	03/04/87	03/04/87	03/04/87	03/04/87
CADMIUM		1.20 ppm	0.36 ppm	0.38 ppm	0.20 ppm
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

PARAMETER	SAMPLE ID :	B-2 E	ST. 200 A	ST. 200 B	ST. 200 C
		03/04/87	03/04/87	03/04/87	03/04/87
	LAB ID :	87030160	87030161	87030162	87030163
	DATE RECEIVED:	03/04/87	03/04/87	03/04/87	03/04/87
CADMIUM		0.98 ppm	2.00 ppm	1.37 ppm	1.11 ppm
ACID DIGESTION		YES	YES	YES	YES

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Laboratory Certification Number 10120

CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106
CONTACT: MR. LANNY L. LEVELL

DATE: 03/05/87

RELEASED BY: G M Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

SAMPLE ID : ST. 200 E
03/04/87

LAB ID : 87030164
DATE RECEIVED: 03/04/87

PARAMETER	
CADMIUM	0.34 ppm
ACID DIGESTION	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

PARAMETER	SAMPLE ID :	ST. 240 A	ST. 240 B	ST. 240 C	ST. 240 D
		03/04/87	03/04/87	03/04/87	03/04/87
	LAB ID :	87030165	87030166	87030167	87030168
	DATE RECEIVED:	03/04/87	03/04/87	03/04/87	03/04/87
CHROMIUM		6.08 ppm	<1.00 ppm	2.67 ppm	20.9 ppm
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

PARAMETER	SAMPLE ID :	ST. 250 A	ST. 250 B	ST. 250 C	ST. 250 D
		03/04/87	03/04/87	03/04/87	03/04/87
	LAB ID :	87030169	87030170	87030171	87030172
	DATE RECEIVED:	03/04/87	03/04/87	03/04/87	03/04/87
CADMIUM		0.94 ppm	0.96 ppm	1.37 ppm	0.98 ppm
LEAD				37.8 ppm	48.4 ppm
ACID DIGESTION		YES	YES	YES	YES

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1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

SAMPLE ID : ST. 250 E
03/04/87

LAB ID : 87030173
DATE RECEIVED: 03/04/87

PARAMETER	
CADMIUM	1.18 ppm
ACID DIGESTION	YES

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1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/05/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

	SAMPLE ID :	C-3 A	C-3 B	C-3 C	C-3 D
		03/04/87	03/04/87	03/04/87	03/04/87
	LAB ID :	87030174	87030175	87030176	87030177
PARAMETER	DATE RECEIVED:	03/04/87	03/04/87	03/04/87	03/04/87
LEAD		278 ppm	33.9 ppm	80.4 ppm	295 ppm
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/06/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: G.M. Greene
for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

	SAMPLE ID :	C-3 A 30" 15'W 5'N	C-3 B 30" 20'W	C-3 C 30" 15'W 5'S	C-3 D 30" 15'S 5'W
	LAB ID :	87030240	87030241	87030242	87030243
PARAMETER	DATE RECEIVED:	03/06/87	03/06/87	03/06/87	03/06/87
LEAD		38.2 ppm	27.6 ppm	44.3 ppm	72.4 ppm
ACID DIGESTION		YES	YES	YES	YES

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OMAHA , NE 68106

DATE: 03/06/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

	SAMPLE ID :	C-3 E 30" 15'S 5'E	C-3 F 30" 20'S 5'E	ST. 250 A 25'W 15'SE 30"	ST. 250 B 25'W 5'W OF A 30"
	LAB ID :	87030244	87030245	87030246	87030247
PARAMETER	DATE RECEIVED:	03/06/87	03/06/87	03/06/87	03/06/87
CADMIUM				0.53 ppm	1.00 ppm
LEAD		34.2 ppm	28.7 ppm		
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/06/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: A.M. Greene
for: GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC3

PARAMETER	SAMPLE ID :	ST. 250 C 25'W 5'N 30"	ST. 250 D 56'E 10'N 18"	ST. 250 E 61'E 5'N 18"	ST. 250 F 56'E 30"
	LAB ID :	87030248	87030249	87030250	87030251
	DATE RECEIVED:	03/06/87	03/06/87	03/06/87	03/06/87
CADMIUM		0.78 ppm	1.07 ppm	1.18 ppm	3.33 ppm
ACID DIGESTION		YES	YES	YES	YES

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CLIENT: ANDERSON EXCAVATING & WRECKING CO.
1824 SO. 20th STREET
OMAHA , NE 68106

DATE: 03/10/87

CONTACT: MR. LANNY L. LEVELL

RELEASED BY: for GEORGE C. GREENE PE,PHD

CC/FC: AEWC/AEWC2

	SAMPLE ID :	ST. 200 A	ST. 200 B
		03/09/87	03/09/87
	LAB ID :	87030289	87030290
PARAMETER	DATE RECEIVED:	03/09/87	03/09/87
CADMIUM		0.59 ppm	<0.20 ppm
ACID DIGESTION		YES	YES

Prior to Final Closure

Analytical Data - October 2, 1987

Source: EnSafe files.

SULLIVAN DIVISION [illegible] LIMITED
DELIVERY [illegible]
METHOD DETECTION LIMITS

	METHOD DETECTION LIMIT (ppm)
2-AMINOPYRIDINE	1.0
HYDRAZINE	2.5
PENTACHLOROPHENOL	1.0
FORMALDEHYDE	1.0
PYRIDINE	1.0
CRESOL (TOTAL)	1.0

	METHOD DETECTION LIMIT (ppb)
METHYLENE CHLORIDE	5.0
CHLOROFORM	5.0
1,1,1-TRICHLOROETHANE	5.0
CARBON TETRACHLORIDE	5.0
1,2-DICHLOROETHANE	5.0
TRICHLOROETHYLENE	5.0
TETRACHLOROETHYLENE	5.0
TOLUENE	5.0
DICHLOROFLUOROMETHANE	5.0
TRICHLOROFLUOROMETHANE	5.0
DIETHYL ETHER	5.0
METHYL ETHYL KETONE	5.0
METHYL ISOBUTYL KETONE	5.0
ETHYLENE OXIDE	5.0

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER 0061 - OLD DEFAL
SOIL SAMPLES

SAMPLE ID	Z-4	Z-5	Z-6	Z-7	Y-7	Y-8	Y-6	Y-5	Y-4
SAMPLE DATE	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87
(as received ppb)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	BDL	BDL	BDL	BDL	BDL	15.5	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER 0002 - OLD CORRAL
SOIL SAMPLES

SAMPLE ID	Y-3	Y-2	Y-1	X-8	X-7	X-6	X-5	X-4	W-3
SAMPLE DATE	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87
(as received ppm)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	6.4	BDL	8.4	21.6	16.5	BDL	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER 0002 - OLD CORRAL
SOIL SAMPLES

SAMPLE ID	W-8	W-7	W-6	W-5	W-4	V-5	V-6	V-7	U-6
SAMPLE DATE	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87	10/02/87
(as received ppm)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	BDL	BDL	BDL	BDL	16.3	26.5	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER [illegible] - OLD CORRAL
SOIL SAMPLES

SAMPLE ID	SP-13	SP-14	SP-15	SP-16	SP-17	SP-18	SP-19	SP-20	SP-21
SAMPLE DATE	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87
(as received ppm)									
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)									
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	6.0	BDL	BDL	15.0	BDL	BDL	14.6	42.9	7.6
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER NUMBER 0081 - OLD CORRAL
SOIL SAMPLES

SAMPLE ID	SP-22	SP-23	SP-24	SP-25	SP-26	SP-27
SAMPLE DATE	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87	10/08/87
(as received ppm)						
2-AMINOPYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL
HYDRAZINE	BDL	BDL	BDL	BDL	BDL	BDL
PENTACHLOROPHENOL	BDL	BDL	BDL	BDL	BDL	BDL
FORMALDEHYDE	BDL	BDL	BDL	BDL	BDL	BDL
PYRIDINE	BDL	BDL	BDL	BDL	BDL	BDL
CRESOL (TOTAL)	BDL	BDL	BDL	BDL	BDL	BDL
(as received ppb)						
METHYLENE CHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL
CHLOROFORM	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-TRICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL
CARBON TETRACHLORIDE	BDL	BDL	BDL	BDL	BDL	BDL
1,2-DICHLOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	BDL	BDL	BDL	BDL	BDL	BDL
TOLUENE	BDL	BDL	BDL	BDL	BDL	BDL
DICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROETHANE	BDL	BDL	BDL	BDL	BDL	BDL
TRICHLOROFLUOROMETHANE	BDL	BDL	BDL	BDL	BDL	BDL
DIETHYL ETHER	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ETHYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL
METHYL ISOBUTYL KETONE	BDL	BDL	BDL	BDL	BDL	BDL
ETHYLENE OXIDE	BDL	BDL	BDL	BDL	BDL	BDL

BDL - BELOW DETECTION

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER 0061
DUPLICATE RESULTS SUMMARY

	Z-1			Y-8'			W-9'			AA-2			SP-13		
	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP	1ST	2ND	% DUP
(as received ppm)															
2-AMINOPYRIDINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
HYDRAZINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
PENTACHLOROPHENOL	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
FORMALDEHYDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
PYRIDINE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CRESOL (TOTAL)	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
(as received ppb)															
METHYLENE CHLORIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CHLOROFORM	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
',1,1-TRICHLOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
CARBON TETRACHLORIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
1,2-DICHLOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROETHYLENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TETRACHLOROETHYLENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TOLUENE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
DICHLOROFLUOROMETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROFLUOROETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
TRICHLOROFLUOROMETHANE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
DIETHYL ETHER	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	42.0	40.0	95	9.3	6.0	65
METHYL ETHYL KETONE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
METHYL ISOBUTYL KETONE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100
ETHYLENE OXIDE	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100	BDL	BDL	100

1ST - ORIGINAL SAMPLE
2ND - DUPLICATE
%DUP - % DUPLICATION
BDL - BELOW DETECTION LIMIT

SOUTHERN DIVISION NAVAL FACILITY
DELIVERY ORDER 0082
MATRIX SPIKE RESULTS

	Z-1					Y-8'					W-9'				
	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC
(as received ppm)															
HYDRAZINE	BDL	67.4	67.4	25.7	38	BDL	67.4	67.4	21.1	31	BDL	67.4	67.4	41.2	64
PYRIDINE	BDL	72.4	72.4	36.2	50	BDL	72.4	72.4	29.6	41	BDL	72.4	72.4	43.1	60
O-CRESOL	BDL	35.2	35.2	52.2	148	BDL	35.2	35.2	30.1	86	BDL	35.2	35.2	37.6	107
(as received ppb)															
METHYLENE CHLORIDE	BDL	9.9	9.9	4.0	40	BDL	9.9	9.9	4.1	42	BDL	9.9	9.9	4.1	42
CHLOROFORM	BDL	11.2	11.2	5.2	44	BDL	11.2	11.2	4.0	36	BDL	11.2	11.2	4.0	36
1,1,1-TRICHLOROETHANE	BDL	10.0	10.0	3.0	30	BDL	10.0	10.0	2.6	26	BDL	10.0	10.0	1.6	16
CARBON TETRACHLORIDE	BDL	12.0	12.0	3.0	25	BDL	12.0	12.0	1.6	20	BDL	12.0	12.0	1.6	13
1,2-DICHLOROETHANE	BDL	9.2	9.2	5.7	62	BDL	9.2	9.2	5.8	63	BDL	9.2	9.2	5.8	63
TRICHLOROETHYLENE	BDL	11.0	11.0	3.2	29	BDL	11.0	11.0	3.2	29	BDL	11.0	11.0	3.5	32
TETRACHLOROETHYLENE	BDL	12.2	12.2	4.4	36	BDL	12.2	12.2	3.6	30	BDL	12.2	12.2	3.6	30
TOLUENE	BDL	12.9	12.9	5.0	39	BDL	12.9	12.9	5.7	44	BDL	12.9	12.9	5.7	44
DIETHYL ETHER	BDL	142	142	123	87	BDL	35.5	35.5	33.9	95	BDL	141	141	102	72
METHYL ETHYL KETONE	BDL	160	160	128	80	BDL	40.0	40.0	33.5	84	BDL	160	160	137	86
METHYL ISOBUTYL KETONE	BDL	160	160	114	72	BDL	40.0	40.0	33.5	84	BDL	160	160	95	59

	AA-2					SP-13				
	SAMPLE RESULT	SPK	EXP	FND	% REC	SAMPLE RESULT	SPK	EXP	FND	% REC
(as received ppm)										
HYDRAZINE	BDL	67.5	67.5	54.6	42	BDL	67.5	67.5	20.4	27
PYRIDINE	BDL	72.4	72.4	28.6	40	BDL	72.4	72.4	18.5	26
O-CRESOL	BDL	35.2	35.2	21.6	52	BDL	35.2	35.2	18.3	61
(as received ppb)										
METHYLENE CHLORIDE	BDL	9.9	9.9	4.5	45	BDL	6.6	6.6	4.3	65
CHLOROFORM	BDL	11.2	11.2	5.5	49	BDL	7.5	7.5	5.3	71
1,1,1-TRICHLOROETHANE	BDL	10.0	10.0	4.0	40	BDL	6.7	6.7	4.6	69
CARBON TETRACHLORIDE	BDL	12.0	12.0	4.0	33	BDL	8.0	8.0	4.2	53
1,2-DICHLOROETHANE	BDL	9.2	9.2	6.5	71	BDL	6.3	6.3	6.0	95
TRICHLOROETHYLENE	BDL	11.0	11.0	3.5	32	BDL	6.7	6.7	4.2	63
TETRACHLOROETHYLENE	BDL	12.2	12.2	4.0	33	BDL	8.1	8.1	4.0	49
TOLUENE	BDL	12.9	12.9	7.0	54	BDL	8.6	8.6	4.6	53
DIETHYL ETHER	42.0	141	182	108	59	7.2	141	148	102	69
METHYL ETHYL KETONE	BDL	160	160	145	91	BDL	160	160	103	64
METHYL ISOBUTYL KETONE	BDL	160	160	125	78	BDL	160	160	145	91

SPK - SPIKE
EXP - EXPECTED
FND - FOUND
% REC - % RECOVERY
BDL - BELOW DETECTION LIMIT

Surface to Six Inch Soil Samples

Source: EnSafe files.

TABLE 3

EVALUATION OF SOIL CONTAMINATION
PUBLIC WORKS STORAGE YARD (OLD CORRAL)

	pH	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	NICKEL	SELENIUM	SILVER
THRESHOLD	6.5 4.3	51.29	2.00	1.25	26.51	146.92	1.00	10.11	0.20	1.00
SAMPLE										
AA-1	8.2 X	71.00 X	0.44	1.23	14.80	154.00 X	0.075	9.37	0.20	0.50
AA-2	7.9 X	17.70	0.30	0.10	6.07	12.10	0.020	2.33	0.20	0.50
AA-3	7.1 X	36.50	0.30	1.12	8.42	29.50	0.020	11.70 X	0.20	0.50
AA-4	7.1 X	25.60	0.30	0.87	10.40	45.20	0.114	8.26	0.20	0.50
AA-5	7.9 X	14.90	0.30	0.10	5.43	8.60	0.020	2.71	0.20	0.50
AA-6	5.1	15.60	0.30	0.10	5.03	8.23	0.020	3.66	0.20	0.50
Z-1	8.1 X	22.80	0.30	1.93 X	15.10	71.50	0.079	7.73	0.20	0.50
Z-2	8.5 X	44.90	0.30	2.17 X	28.00 X	105.00	0.134	15.90 X	0.20	0.50
Z-3	8.6 X	98.80 X	0.30	3.49 X	16.90	63.20	0.020	24.80 X	0.20	1.80 X
Z-4	9.0 X	64.50 X	0.30	5.06 X	12.60	68.90	0.020	36.20 X	0.20	2.62 X
Z-5	8.7 X	99.80 X	0.30	3.23 X	10.30	97.20	0.114	18.10 X	0.20	1.29 X
Z-6	8.3 X	48.70	0.30	4.19 X	17.30	114.00	0.065	67.50 X	0.20	2.41 X
Z-7	8.2 X	30.80	0.46	1.21	28.70 X	77.80	0.183	12.50 X	0.20	0.50
Y-1	8.3 X	45.20	0.30	1.31 X	28.20 X	92.40	0.079	11.70 X	0.20	0.50
Y-2	8.6 X	69.00 X	0.30	2.58 X	12.30	61.80	0.062	17.80 X	0.20	2.12 X
Y-3	8.9 X	92.20 X	0.30	2.58 X	12.40	79.30	0.046	21.80 X	0.20	1.49 X
Y-4	8.8 X	32.50	0.30	0.53	8.25	34.00	0.057	9.71	0.20	0.50
Y-5	10.3 X	51.60 X	0.30	2.56 X	11.90	110.00	2.910 X	14.60 X	0.20	0.50
Y-6	9.0 X	98.90 X	0.30	5.05 X	12.00	76.60	0.107	15.80 X	0.20	1.28 X
Y-7	8.5 X	118.00 X	0.30	4.39 X	11.50	67.40	0.020	30.30 X	0.20	2.56 X
Y-8	8.2 X	20.10	0.30	0.69	9.86	68.60	0.099	9.00	0.20	0.50
X-4	9.0 X	62.50 X	0.30	4.25 X	12.20	73.20	0.020	29.30 X	0.20	2.44 X
X-5	8.7 X	71.00 X	0.30	3.57 X	12.80	64.40	0.123	26.90 X	0.20	1.76 X
X-6	9.3 X	157.00 X	0.30	5.14 X	9.12	61.30	0.020	36.90 X	0.20	3.32 X
X-7	8.7 X	174.00 X	0.30	5.43 X	9.67	67.70	0.020	36.80 X	0.20	3.22 X
X-8	8.7 X	90.80 X	0.30	3.77 X	11.90	56.10	0.053	27.80 X	0.20	1.98 X

TABLE 3 (CONTINUED)

	pH	BARIUM	BERYLLIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	NICKEL	SELENIUM	SILVER
THRESHOLD	6.5 4.3	51.29	2.00	1.25	26.51	146.92	1.00	10.11	0.20	1.00
SAMPLE										
W-4	8.3 X	46.90	0.40	1.35 X	39.40 X	178.00 X	0.151	12.50 X	0.20	0.50
W-5	9.5 X	144.00 X	0.30	4.83 X	8.93	61.00	0.020	33.80 X	0.20	2.97 X
W-6	8.6 X	119.00 X	0.30	3.74 X	11.80	62.90	0.067	32.70 X	0.20	2.37 X
W-7	8.4 X	75.40 X	0.30	3.33 X	5.96	32.80	0.020	22.30 X	0.20	1.49 X
W-8	9.1 X	169.00 X	0.30	4.66 X	9.24	53.50	0.021	34.70 X	0.20	2.69 X
W-9	8.5 X	60.10 X	0.44	2.19 X	15.10	68.40	0.082	15.60 X	0.20	0.50
V-5	8.6 X	116.00 X	0.30	2.67 X	16.00	90.40	0.134	22.80 X	0.20	0.97
V-6	8.3 X	86.40 X	0.30	9.38 X	20.60	160.00 X	0.734	35.40 X	0.20	0.82
V-7	8.9 X	44.80	0.30	1.48 X	16.60	85.90	0.154	16.60 X	0.20	0.50
U-6	8.9 X	49.30	0.30	2.68 X	12.20	44.60	0.044	9.47	0.20	0.50
SP-13	8.2 X	44.50	0.30	3.90 X	13.80	194.00 X	0.020	29.80 X	0.20	2.29 X
SP-14	8.3 X	33.90	0.30	2.99 X	12.00	982.00 X	0.020	22.40 X	0.20	1.50 X
SP-15	8.1 X	31.80	0.30	1.82 X	18.20	90.40	0.054	13.60 X	0.20	0.91
SP-16	8.8 X	42.80	0.30	4.52 X	9.62	64.90	0.020	35.10 X	0.20	8.66 X
SP-17	8.2 X	42.30	0.30	5.27 X	9.45	62.10	0.028	38.80 X	0.20	3.48 X
SP-18	8.2 X	36.50	0.30	2.88 X	12.50	70.10	0.079	21.60 X	0.20	1.44 X
SP-19	9.0 X	81.20 X	0.30	1.34 X	55.70 X	399.00 X	0.105	19.20 X	0.20	0.50
SP-20	8.3 X	39.00	0.30	3.39 X	9.49	684.00 X	0.029	25.00 X	0.20	2.50 X
SP-21	8.3 X	58.40 X	0.30	6.78 X	9.82	59.40	0.051	36.80 X	0.20	2.95 X
SP-22	8.5 X	36.80	0.30	1.52 X	8.75	66.30	0.104	8.29	0.20	0.50
SP-23	8.4 X	39.40	0.30	2.36 X	18.80	54.40	0.090	12.00 X	0.20	0.50
SP-24	8.3 X	66.20 X	0.30	4.82 X	8.27	61.10	0.020	34.00 X	0.20	2.68 X
SP-25	9.4 X	45.80	0.30	3.51 X	9.35	57.00	0.028	34.10 X	0.20	2.34 X
SP-26	8.2 X	29.70	0.30	2.19 X	22.40	108.00	0.201	16.10 X	0.20	0.97
SP-27	8.1 X	30.60	0.30	0.48	11.00	45.00	0.226	3.78	0.20	0.50

Supplemental Samples Collected at

1-, 2-, and 3-foot Intervals

SOUTHERN DIVISION NAVAL FACILITIES
DELIVERY ORDER # 0096
OLD CORRAL SOIL SAMPLES
CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm) pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
1	W8-1	3/21	7.7	18.7	<0.1	-	-	-	<1.0	<0.5
2	W8-2	3/21	8.0	27.8	<0.1	-	-	-	6.73	1.34
3	W8-3	3/21	8.4	25.0	<0.1	-	-	-	10.6	<0.5
4	W9-1	3/21	8.0	36.1	<0.1	-	-	-	11.3	-
5	W9-2	3/21	7.9	23.9	<0.1	-	-	-	7.51	-
6	W9-3	3/21	8.2	22.9	<0.1	-	-	-	8.71	-
7	W7-1	3/21	8.2	29.4	<0.1	-	-	-	8.90	<0.5
8	W7-2	3/21	7.7	25.5	<0.1	-	-	-	10.6	<0.5
9	W7-3	3/21	8.2	19.2	<0.1	-	-	-	10.2	<0.5
10	W6-1	3/21	8.1	27.3	<0.1	-	-	-	13.1	0.64
11	W6-2	3/21	8.2	17.5	<0.1	-	-	-	7.97	<0.5
12	W6-3	3/21	8.5	19.0	<0.1	-	-	-	8.85	<0.5
13	W5-1	3/21	9.4	46.1	<0.1	-	-	-	8.20	1.17
14	W4-1	3/21	7.4	-	<0.1	4.46	12.4	-	2.23	-
15	W4-2	3/21	7.4	-	<0.1	2.86	12.9	-	1.19	-
16	V6-1	3/21	8.4	13.8	<0.1	-	34.3	-	2.32	-
17	V6-2	3/21	8.4	21.4	<0.1	-	32.4	-	10.6	-
18	V6-3	3/21	8.4	16.8	<0.1	-	23.1	-	7.33	-
19	V7-1	3/21	8.7	-	<0.1	-	-	-	1.96	-
20	U6-1	3/21	7.7	-	<0.1	-	-	-	-	-
21	U6-2	3/21	7.7	-	<0.1	-	-	-	-	-
22	U6-3	3/21	8.2	-	<0.1	-	-	-	-	-
23	V5-1	3/21	8.1	21.1	<0.1	-	-	-	5.64	-
24	X4-1	3/21	8.3	20.1	<0.1	-	-	-	3.50	<0.5
25	X4-2	3/21	8.8	24.6	<0.1	-	-	-	4.43	<0.5
26	X5-1	3/21	7.3	30.7	<0.1	-	-	-	14.3	<0.5
27	X5-2	3/21	7.4	22.5	<0.1	-	-	-	10.2	<0.5
28	X5-3	3/21	8.5	21.7	<0.1	-	-	-	10.7	<0.5
29	X6-1	3/21	7.5	26.2	<0.1	-	-	-	11.3	<0.5
30	X6-2	3/21	7.7	20.5	<0.1	-	-	-	11.0	<0.5
31	X6-3	3/21	8.5	23.8	<0.1	-	-	-	10.9	<0.5
32	X7-1	3/21	7.8	22.0	<0.1	-	-	-	7.65	<0.5
33	X7-2	3/21	8.1	23.6	<0.1	-	-	-	11.1	<0.5
34	X7-3	3/21	8.1	18.4	<0.1	-	-	-	8.72	<0.5
35	X8-1	3/21	7.2	23.3	<0.1	-	-	-	8.82	<0.5
36	X8-2	3/21	8.0	20.2	<0.1	-	-	-	9.48	<0.5
37	X8-3	3/21	8.3	31.1	<0.1	-	-	-	12.0	<0.5
38	Y8-1	3/21	7.6	-	-	-	-	-	-	-
39	Y8-2	3/21	7.4	-	-	-	-	-	-	-
40	Y8-3	3/21	7.6	-	-	-	-	-	-	-

SOUTHERN DIVISION NAVAL FACILITIES
DELIVERY ORDER # 0096
OLD CORRAL SOIL SAMPLES
CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm) pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
85	SP13-1	3/23	8.0	-	<0.1	-	22.9	-	13.7	<0.5
86	SP15-1	3/23	5.5	-	<0.1	-	-	-	3.13	-
87	SP16-1	3/23	6.7	-	<0.1	-	-	-	2.71	<0.5
88	SP17-1	3/23	7.6	-	<0.1	-	-	-	1.96	<0.5
89	SP17-2	3/23	6.0	-	<0.1	-	-	-	2.79	<0.5
90	SP17-3	3/23	7.9	-	<0.1	-	-	-	4.82	<0.5
91	SP18-1	3/23	7.3	-	<0.1	-	-	-	3.94	<0.5
92	SP18-2	3/23	7.4	-	<0.1	-	-	-	2.54	<0.5
93	SP18-3	3/23	8.4	-	<0.1	-	-	-	12.0	<0.5
94	SP19-1	3/23	7.7	22.7	1.19	9.40	11.3	-	2.21	-
95	SP19-2	3/23	8.1	42.1	2.33	13.4	271	-	66.9	-
96	SP19-3	3/23	8.1	21.4	<0.1	22.4	20.9	-	10.5	-
97	SP20-1	3/23	6.5	-	<0.1	-	7.66	-	1.21	<0.5
98	SP20-2	3/23	8.0	-	<0.1	-	41.2	-	9.67	<0.5
99	SP20-3	3/23	8.2	-	<0.1	-	20.9	-	7.62	<0.5
00	SP21-1	3/23	8.1	32.0	<0.1	-	-	-	6.69	<0.5
01	SP21-2	3/23	8.3	32.8	<0.1	-	-	-	10.5	<0.5
102	SP21-3	3/23	8.3	25.1	<0.1	-	-	-	5.94	<0.5
103	SP22-1	3/23	9.2	-	<0.1	-	-	-	-	-
104	SP23-1	3/23	8.2	-	<0.1	-	-	-	3.49	-
105	SP24-1	3/23	7.1	35.5	<0.1	-	-	-	11.4	<0.5
106	SP24-2	3/23	7.6	19.4	<0.1	-	-	-	8.62	<0.5
107	SP24-3	3/23	8.2	26.5	2.47	-	-	-	10.3	<0.5
108	SP25-1	3/23	8.2	-	<0.1	-	-	-	8.04	<0.5
109	SP25-2	3/23	8.6	-	6.61	-	-	-	9.87	<0.5
110	SP25-3	3/23	8.8	-	11.5	-	-	-	5.86	<0.5
111	SP26-1	3/23	7.3	-	11.1	-	-	-	12.3	-
112	SP26-2	3/23	7.1	-	<0.1	-	-	-	12.3	-
113	SP26-3	3/23	8.2	-	<0.1	-	-	-	7.72	-
114	SP27-1	3/23	8.3	-	-	-	-	-	-	-
115	SP27-2	3/23	8.3	-	-	-	-	-	-	-
116	SP27-3	3/23	8.1	-	-	-	-	-	-	-
117	Z1-1	3/23	8.7	-	11.1	-	-	-	-	-
118	Y1-1	3/24	8.1	-	<0.1	3.95	-	-	<1.0	-
119	BG1-2	3/24	8.8	-	-	-	-	-	-	-
120	BG2-2	3/24	5.4	-	-	-	-	-	-	-
121	BG3-2	3/24	5.0	-	-	-	-	-	-	-

SOUTHERN DIVISION NAVAL FACILITIES

DELIVERY ORDER # 0096

OLD CORRAL SOIL SAMPLES

CHARLESTON, SC NAVAL SHIPYARD

ETC #	Sample I.D.	Date	Results (as received ppm)							
			pH	Barium	Cadmium	Chromium	Lead	Mercury	Nickel	Silver
85	SP13-1	3/23	8.0	-	<0.1	-	22.9	-	13.7	<0.5
86	SP15-1	3/23	5.5	-	<0.1	-	-	-	3.13	-
87	SP16-1	3/23	6.7	-	<0.1	-	-	-	2.71	<0.5
88	SP17-1	3/23	7.6	-	<0.1	-	-	-	1.96	<0.5
89	SP17-2	3/23	6.0	-	<0.1	-	-	-	2.79	<0.5
90	SP17-3	3/23	7.9	-	<0.1	-	-	-	4.82	<0.5
91	SP18-1	3/23	7.3	-	<0.1	-	-	-	3.94	<0.5
92	SP18-2	3/23	7.4	-	<0.1	-	-	-	2.54	<0.5
93	SP18-3	3/23	8.4	-	<0.1	-	-	-	12.0	<0.5
94	SP19-1	3/23	7.7	22.7	1.19	9.40	11.3	-	2.21	-
95	SP19-2	3/23	8.1	42.1	2.33	13.4	271	-	66.9	-
96	SP19-3	3/23	8.1	21.4	<0.1	22.4	20.9	-	10.5	-
97	SP20-1	3/23	6.5	-	<0.1	-	7.66	-	1.21	<0.5
98	SP20-2	3/23	8.0	-	<0.1	-	41.2	-	9.67	<0.5
99	SP20-3	3/23	8.2	-	<0.1	-	20.9	-	7.62	<0.5
00	SP21-1	3/23	8.1	32.0	<0.1	-	-	-	6.69	<0.5
101	SP21-2	3/23	8.3	32.8	<0.1	-	-	-	10.5	<0.5
102	SP21-3	3/23	8.3	25.1	<0.1	-	-	-	5.94	<0.5
103	SP22-1	3/23	9.2	-	<0.1	-	-	-	-	-
104	SP23-1	3/23	8.2	-	<0.1	-	-	-	3.49	-
105	SP24-1	3/23	7.1	35.5	<0.1	-	-	-	11.4	<0.5
106	SP24-2	3/23	7.6	19.4	<0.1	-	-	-	8.62	<0.5
107	SP24-3	3/23	8.2	26.5	2.47	-	-	-	10.3	<0.5
108	SP25-1	3/23	8.2	-	<0.1	-	-	-	8.04	<0.5
109	SP25-2	3/23	8.6	-	6.61	-	-	-	9.87	<0.5
110	SP25-3	3/23	8.8	-	11.5	-	-	-	5.86	<0.5
111	SP26-1	3/23	7.3	-	11.1	-	-	-	12.3	-
112	SP26-2	3/23	7.1	-	<0.1	-	-	-	12.3	-
113	SP26-3	3/23	8.2	-	<0.1	-	-	-	7.72	-
114	SP27-1	3/23	8.3	-	-	-	-	-	-	-
115	SP27-2	3/23	8.3	-	-	-	-	-	-	-
116	SP27-3	3/23	8.1	-	-	-	-	-	-	-
117	Z1-1	3/23	8.7	-	11.1	-	-	-	-	-
118	Y1-1	3/24	8.1	-	<0.1	3.95	-	-	<1.0	-
119	BG1-2	3/24	8.8	-	-	-	-	-	-	-
120	BG2-2	3/24	5.4	-	-	-	-	-	-	-
121	BG3-2	3/24	5.0	-	-	-	-	-	-	-

Supplemental Sampling

Station W-5

Note: Three background samples were collected at depth 0-1 foot at locations near background sample locations from previous sampling events, specifically:

* south of the golf course pro shop (at the end of Everglades Drive);

* within the dredge spoil containment area northeast of the brigg (on Juneau Avenue); and

* behind the missile monument at the intersection of Viaduct Road and Hobson Avenue (about 200 yards west of the old corral).

Source: EnSafe. February, 1991. Supplemental Smpling Old Corral Station W-5.

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene
President

George C. Greene, P.E., Ph.D
Vice President
SC Registration No. 9105

Laboratory Certifications:

FL	E87156-87294
NC	253
SC	10120
VA	00151
TN	02934

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/06/91

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: QA/QC Officer

cc/fc: ENSA/ENSAU Project Manager: Edie M. Kent Page No.: 1

Parameter	Sample ID :	W-S-1	W-S-2	W-S-3
	Lab ID :	91011918	91011919	91011920
	Sample Matrix :	SOLID	SOLID	SOLID
	Date Collected:	01/25/91	01/25/91	01/25/91
	Date Received :	01/25/91	01/25/91	01/25/91
	Priority :	Routine	Routine	Routine
	Collected by :	GEL	GEL	GEL
ACETONE		<100 ppb	<100 ppb	<100 ppb
XYLENE, TOTAL		<200 ppb	<200 ppb	<200 ppb
METHANOL		<1 ppm	<1 ppm	<1 ppm
PENTACHLOROPHENOL		<100 ppb	<100 ppb	<100 ppb
SAMPLE PREP - ACID COMPOUNDS		YES	YES	YES
EVAPORATIVE LOSS @ 105 C		10 wt%	13 wt%	40 wt%
CATION EXCHANGE CAPACITY		6.84 meq	6.24 meq	18.2 meq

P.O. Box 30712 • Charleston, SC 29417
Phone (803) 556-8171 FAX (803) 766-1178

A&L Analytical Laboratories, Inc.

411 North Third Street • Memphis, TN 38105-2723 • (901) 527-2780 • FAX: (901) 526-1031

REPORT NUMBER
036-005A

ACCT # 1388

February 6, 1991

RECEIVED
FEB - 7

Ensafe
5724 Summer Trees Dr.
P.O. Box 341315
Memphis, TN 38184-1315

LAB NUMBER:	SAMPLE ID:	CEC (meq/100g)	BASE SATURATION (%)
26602	W51	4.1	100
26603	W52	3.8	100
26604	W53	10.3	100
26605	BKA	4.3	100
26606	BKB	8.1	100
26607	BKC	10.8	100

NOTE: All samples had free carbonates.

A & L Analytical Laboratories, Inc.

Richard Large, PhD Managing Director

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A&L Analytical Laboratories, Inc.

411 North Third Street • Memphis, TN 38105-2723 • (901) 527-2780 • FAX: (901) 526-1031

Additional Results

REPORT NUMBER
036-004A

ACCT # 1388

February 12, 1991

RECEIVED FEB 13

Ensafe
5724 Summer Trees Dr.
P.O. Box 341315
Memphis, TN 38184-1315
Attn: James Speakman

Project # 1073-040

LAB NUMBER:	SAMPLE ID:	K ppm	Mg ppm	Ca ppm	Na ppm	pH	% Free Carbonate
26602	W51	125	152	2150	350	7.7	7.77
26603	W52	125	131	2220	520	8.1	8.63
26604	W53	576	649	2660	2910	8.0	12.02
26605	BKA	74	128	1770	20	7.6	2.76
26606	BKB	53	76	2490	19	7.9	5.71
26607	BKC	30	87	2800	10	7.7	4.57

NOTE: Cations run by IN Ammonium Acetate at pH 7.0
pH is 1:1 soil water ratio
Free Carbonates ASA 91-5.1 (1965)

A & L Analytical Laboratories, Inc.

Richard Large

Richard Large, PhD Managing Director

RL/dlh

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APPENDIX G

PCB Transformer Storage Area - Analytical Data

(Source: Reference 12)

GENERAL ENGINEERING LABORATORIES

Full Service Chemical Testing and Analysis

Office & Lab.
1313 Ashley River Road
Charleston, S.C.
Phone (803) 556-8171

Mailing Address
P.O. Box 30712
Charleston, S.C. 29407

Analysis Sheet

Client Geraghty & Miller, Inc.
P.O. Box 271173
Tampa, Florida 33688

Date July 16, 1981
P.O. No.
Requested by Mr. Peter Palmer

Sample Identification

Analysis of Soil Samples for PCBs

Results

Sample Identification	PCB Concentration
Sample A	<10 mg/kg
Sample B	<10 mg/kg
Sample C	<10 mg/kg
Sample D	<10 mg/kg
Sample E	<10 mg/kg
Sample F	<10 mg/kg

By George C. Greene

George C. Greene, PhD

ENERGY RESOURCES CO. INC

INORGANIC ANALYSIS

- Report Sheet -
µg/gm dry wgt.

Analyzed for: Geraghty & Miller
Sediments

ERCO ID	CLIENT ID	As
IC-82		
562	OC-1	6.7
563	OC-2	6.0
564	OC-3	15.5
565	OC-4	4.1
566	OC-5	2.1
567	OC-6	10.2
568	OC-7	7.3
569	OC-8	6.9

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID#.

Sample Rcvd. 2/17/82 Reported by Lae

Date Analysis Completed 3/16/82 Checked by MEL

ENERGY RESOURCES CO. INC

INORGANIC ANALYSIS

- Report Sheet -
µg/gm dry wgt. - µg/l

Analyzed for: Geraghty & Miller
Sediments - waters

ERCO ID	CLIENT ID	As
IC-82-		
	Sediments	µg/gm
570	OC-9	3.9
570	ERCO DUPLICATE	3.3
571	OC-10	5.1
572	OC-11	2.8
573	OC-12	1.3
	Waters	µg/l
574	WOC-1	19
575	WOC-2	13

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID#.

Sample Rcvd. 2/17/82 Reported by [illegible]

Date Analysis Completed 3/16/82 Checked by [illegible]

ENERGY RESOURCES CO. INC.
PESTICIDE ANALYSIS REPORT

Analyzed for: Geraghty & Miller All results in: µg/l (ppb)

Client ID:		WOC-1	WOC-2
89P	aldrin	ND	ND
90P	dieldrin	ND	ND
91P	chlordane	ND	ND
92P	4,4'-DDT	0.2	ND
93P	4,4'-DDE	ND	ND
94P	4,4'-DDD	ND	0.1
95P	alpha-endosulfan	ND	ND
96P	beta-endosulfan	ND	ND
97P	endosulfan sulfate	ND	ND
98P	endrin	ND	ND
99P	endrin aldehyde	ND	ND
100P	heptachlor	ND	ND
101P	heptachlor epoxide	ND	ND
102P	alpha-BHC	ND	1.0
103P	beta-BHC	ND	ND
104P	gamma-BHC	ND	1.0
105P	delta-BHC	ND	1.0
106P	PCB-1242	ND	ND
107P	PCB-1254	ND	ND
108P	PCB-1221	ND	ND
109P	PCB-1232	ND	ND
110P	PCB-1248	ND	ND
111P	PCB-1260	0.2	0.6
112P	PCB-1016	ND	ND
113P	toxaphene	ND	ND

Sample Received: 2/17/82 Reported by: E Kwang
Date Completed: 3/25/82 Checked by: [illegible]

Comments: ND = not detected (less than 1. µg/l)

ENERGY RESOURCES CO. INC.
PESTICIDE ANALYSIS REPORT

Analyzed for: Geraghty & Miller All results in: ng/gm (ppb)

Client ID:	OC-1	OC-2	OC-3	OC-4	OC-5
89P aldrin	ND	ND	ND	ND	ND
90P dieldrin	ND	ND	ND	ND	ND
91P chlordane	ND	ND	ND	ND	ND
92P 4,4'-DDT	28,000.	4,400.	1,600.	100.	7.
93P 4,4'-DDE	11,000.	3,600.	1,300.	230.	9.
94P 4,4'-DDD	6,100.	1,400.	720.	7.	1.
95P alpha-endosulfan	ND	ND	ND	ND	ND
96P beta-endosulfan	ND	ND	ND	ND	ND
97P endosulfan sulfate	ND	ND	ND	ND	ND
98P endrin	ND	ND	ND	ND	ND
99P endrin aldehyde	ND	ND	ND	ND	ND
100P heptachlor	7.	ND	1.	2.	1.
101P heptachlor epoxide	ND	ND	ND	ND	ND
102P alpha-BHC	60.	2.	2.	ND	ND
103P beta-BHC	120.	77.	ND	ND	ND
104P gamma-BHC	150.	ND	ND	ND	ND
105P delta-BHC	780.	4.	17.	1.	ND
106P PCB-1242	ND	ND	ND	ND	ND
107P PCB-1254	ND	ND	ND	ND	ND
108P PCB-1221	ND	ND	ND	ND	ND
109P PCB-1232	ND	ND	ND	ND	ND
110P PCB-1248	ND	ND	ND	ND	ND
111P PCB-1260	ND	62,000.	37,000.	675.	150.
112P PCB-1016	ND	ND	ND	ND	ND
113P toxaphene	ND	ND	ND	ND	ND

Sample Received: 2/17/82 Reported by: E. Kwong
Date Completed: 3/25/82 Checked by: [illegible]
Comments: ND = not detected (less than ng/gm)

ENERGY RESOURCES CO. INC.
PESTICIDE ANALYSIS REPORT

Analyzed for: Geraghty & Miller All results in: ng/gm (ppb)

Client ID:	OC-6	OC-7	OC-8	OC-9	OC-10
89P aldrin	ND	ND	ND	ND	ND
90P dieldrin	ND	ND	ND	ND	ND
91P chlordane	ND	ND	ND	ND	ND
92P 4,4'-DDT	1,100.	13,000.	3,200.	29.	11,000.
93P 4,4'-DDE	560.	3,300.	600.	18.	2,900.
94P 4,4'-DDD	94.	2,700.	1,400.	17.	2,600.
95P alpha-endosulfan	ND	ND	ND	ND	ND
96P beta-endosulfan	ND	ND	ND	ND	ND
97P endosulfan sulfate	ND	ND	ND	ND	ND
98P endrin	ND	ND	ND	ND	ND
99P endrin aldehyde	ND	ND	ND	ND	ND
100P heptachlor	1.	1.	ND	ND	10.
101P heptachlor epoxide	ND	ND	ND	ND	ND
102P alpha-BHC	ND	2.	1.	1.	5.
103P beta-BHC	ND	20.	14.	ND	45.
104P gamma-BHC	1.	44.	22.	ND	43.
105P delta-BHC	1.	150.	88.	1.	171.
106P PCB-1242	ND	ND	ND	ND	ND
107P PCB-1254	ND	ND	ND	ND	ND
108P PCB-1221	ND	ND	ND	ND	ND
109P PCB-1232	ND	ND	ND	ND	ND
110P PCB-1248	ND	ND	ND	ND	ND
111P PCB-1260	3,200.	3,000.	1,100.	170.	530.
112P PCB-1016	ND	ND	ND	ND	ND
113P toxaphene	ND	ND	ND	ND	ND

Sample Received: 2/17/82 Reported by: E. Kwong
Date Completed: 3/25/82 Checked by: [illegible]
Comments: ND = not detected (less than 1. ng/gm)

ENERGY RESOURCES CO. INC.
PESTICIDE ANALYSIS REPORT

Analyzed for: Geraghty & Miller All results in: ng/gm (ppb)

Client ID:	OC-11	OC-12	Blank	OC-9*	OC-10*
89P aldrin	ND	ND	ND	ND	ND
90P dieldrin	ND	ND	ND	ND	ND
91P chlordane	ND	ND	ND	ND	ND
92P 4,4'-DDT	40,000.	1,200.	ND	48.	14,000.
93P 4,4'-DDE	8,200.	590.	ND	20.	3,100.
94P 4,4'-DDD	6,900.	380.	ND	23.	3,000.
95P alpha-endosulfan	ND	ND	ND	ND	ND
96P beta-endosulfan	ND	ND	ND	ND	ND
97P endosulfan sulfate	ND	ND	ND	ND	ND
98P endrin	ND	ND	ND	ND	ND
99P endrin aldehyde	ND	ND	ND	ND	ND
100P heptachlor	29.	ND	ND	ND	8.
101P heptachlor epoxide	ND	ND	ND	ND	ND
102P alpha-BHC	25.	1.	ND	1.	10.
103P beta-BHC	140.	2.	ND	ND	62.
104P gamma-BHC	150.	3.	ND	ND	64.
105P delta-BHC	660.	ND	ND	1.	240.
106P PCB-1242	ND	ND	ND	ND	ND
107P PCB-1254	ND	ND	ND	ND	ND
108P PCB-1221	ND	ND	ND	ND	ND
109P PCB-1232	ND	ND	ND	ND	ND
110P PCB-1248	ND	ND	ND	ND	ND
111P PCB-1260	11,000.	ND	ND	180.	510.
112P PCB-1016	ND	ND	ND	ND	ND
113P toxaphene	ND	ND	ND	ND	ND

Sample Received: 2/17/82 Reported by: E. Kwong
Date Completed: 3/25/82 Checked by: [illegible]

Comments: ND = not detected (less than ng/gm)
*Duplicate

pH MEASUREMENTS OF WATER SAMPLES
COLLECTED FROM MONITOR WELLS
AT THE ELECTRICAL TRANSFORMER STORAGE AREA,
FEBRUARY 12, 1982[1]

Well Number	pH
WOC-1	7.36
WOC-2	7.33

[1] Measured at the time of sample collection.

APPENDIX H

Oil Sludge Pit - Analytical Data

(Source: Reference 12)

ENERGY RESOURCES CO. INC.

INORGANIC CHEMISTRY LABORATORY

- Report of Chemical Analyses -

Client: Geraghty & Miller
Charleston, S.C.

ERCO ID	Client ID	Cl Concentration (gm/l)
51-928	OP-1	6.0
51-929	OP-3	1.4

Sample Rcvd. 7/30/81
Date Completed 8/25/81
Date of this rpt. 5/4/82
Reported by Kah
Checked by

Sample Rcvd: 8/3/81

Date Analysis Completed: 8/26/81

All Results In:

Reported By: Kathy Hemmerle

Checked By: Kah

ENERGY RESOURCES CO. INC.

POLYCHLORINATED BIPHENYLS (PCB)

- Report Sheet -

Analyzed for: Geraghty Miller

	Detection Limit	51-928 OP-1 28-312	51-929 OP-3 28-313
Aroclor 1221		ND	ND
Aroclor 1232		ND	ND
Aroclor 1016		ND	ND
Aroclor 1242		ND	ND
Aroclor 1248		ND	ND
Aroclor 1254		ND	ND
Aroclor 1260		.04ppb	ND
Aroclor 1262		ND	ND

Comments:

300B17/3-81

pH MEASUREMENTS OF WATER SAMPLES
COLLECTED FROM MONITOR WELLS AT THE
OIL-SLUDGE PIT AREA,
JULY 29, 1981[1]

Well Number	pH
OPW-1	7.50
OPW-3	6.40

[1] Measured at the time of sample collection.

ENERGY RESOURCES CO. INC

TRACE METAL ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller
Charleston, S.C.

mg/l unless otherwise stated

ERCO ID	CLIENT ID	F	NO^3	SO_4	TOC	COND umhos/cm
51-928	OP-1	--	--	<1	--	--
51-929	OP-3	--	--	780	--	--

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID #.

Sample Rcvd. 7/30/81 Reported by [illegible]

Date Analysis Completed 8/25/81 Checked by [illegible]

Sample Rcvd: 7/30/81
Date Analysis Completed: 8/7/81
All Results In: mg/l
Reported By:
Checked By:

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller

Compounds (in order of elution)	OP-1	OP-3
Vinyl chloride		
Methylene chloride	0.84	0.17
1,1-dichloroethylene		
1,1-dichloroethane		
trans-1,2-dichloroethylene		
1,2-dichloroethane		
1,1,1-trichloroethane		
1,2-Dichloropropane		
Trichloroethylene		
1,1,2-Trichloroethane		
Tetrachloroethylene		
Chlorobenzene		
Unknown	1.39	

Comments: All blank spaces are ND's (n detected) (<0.05 mg/l, or 50 ppb)

APPENDIX I

Closed Landfill - Analytical Data

(Source: Reference 9, 17)

APPENDIX I-1

Closed Landfill - Analytical Data

(Source: Reference 9)

ENERGY RESOURCES CO. INC

TRACE METAL ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller
Charleston, S.C.

mg/l unless otherwise stated

ERCO ID	CLIENT ID	F	NO^3	SO_4	TOC	COND umhos/cm
51-920	LF-1	0.34	<0.01	28	120	32,000
51-921	LF-2	0.16	0.10	15	120	6,400
51-922	LF-3	0.29	<0.01	<1	88	40,000
51-923	LF-4	0.56	<0.01	600	100	31,000
51-924	LF-5	0.53	<0.01	<1	150	36,000
51-925	SLF-1	0.52	<0.01	<1	63	6,500
51-926	SLF-2	0.25	<0.01	130	67	19,000
51-927	DLF-1	0.16	0.25	37	57	580

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID #.

Sample Rcvd. 7/30/81 Reported by Nat

Date Analysis Completed 8/25/81 Checked by Kah

ENERGY RESOURCES CO. INC

TRACE METAL ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller
Charleston, S.C.

ug/l unless otherwise stated

ERCO ID	CLIENT ID	Cd	Fe	Pb	Mg mg/l	Hg	Na mg/l
51-920	LF-1	<1	58	<5	760	0.4	6000
51-921	LF-2	<1	80	<5	110	<0.1	1200
51-922	LF-3	<1	600	<5	1020	<0.1	7200
51-923	LF-4	<1	4100	<5	560	<0.1	5100
51-924	LF-5	<1	310	<5	960	<0.1	6800
51-925	SLF-1	<1	1700	<5	140	<0.1	1000
51-926	SLF-2	<1	320	<5	140	<0.1	3000
51-927	DLF-1	<1	36	<5	1.6	<0.1	34

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID #.

Sample Rcvd. 7/30/81 Reported by [illegible]

Date Analysis Completed 8/25/81 Checked by [illegible]

ENERGY RESOURCES CO. INC

INORGANIC ANALYSIS

- Report Sheet -
µg/l

Analyzed for: Geraghty & Miller
Waters

ERCO ID	CLIENT ID	As	Ba	Cd	Cr	Pb	Hg	Se	Ag
IC-82-									
578	LF-6	15	380	<2	<5	<5	<0.1	<20	<1
579	LF-7	<10	1300	<2	<5	<5	<0.1	<20	<1
580	LF-8	66	590	<2	<5	18	<0.1	<20	<1
581	LF-9	<10	380	<2	<5	22	<0.1	<20	<1
581	ERCO DUPLICATE	--	370	<2	<5	22	<0.1	<20	<1
582	LF-10	<10	4620	<2	<5	<5	<0.1	<20	<1
583	SLF-1	<10	--	--	<5	--	--	<20	<1
584	SLF-2	<10	--	--	<5	--	--	<20	<1
585	LF-1	70	--	--	0.2	--	--	<20	<1
586	LF-3	24	--	--	<5	--	--	<20	<1
587	LF-4	<10	--	--	<5	--	--	<20	<1

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID#.

Sample Rcvd. 2/17/82 Reported by [illegible]

Date Analysis Completed 3/16/82 Checked by [illegible]

ENERGY RESOURCES CO. INC.

INORGANIC CHEMISTRY LABORATORY

- Report of Chemical Analyses -

Client: Geraghty & Miller
Charleston, S.C.

ERCO ID	Client ID	Cl Concentration (gm/l)
51-920	LF-1	11.0
51-921	LF-2	1.6
51-922	LF-3	7.3
51-923	LF-4	7.2
51-924	LF-5	7.1
51-925	SLF-1	0.93
51-926	SLF-2	3.8
51-927	DLF-1	0.07

Sample Rcvd. 7/30/81
Date Completed 8/25/81
Date of this rpt. 5/4/82
Reported by Kah
Checked by

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. SLF-1

CO I.D. 13-1254

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	ug/l
A	2,4,6-trichlorophenol	ND
A	p-chloro-m-cresol	ND
A	2-chlorophenol	ND
A	2,4-dichlorophenol	ND
A	2,4-dimethylphenol	ND
A	2-nitrophenol	ND
A	4-nitrophenol	ND
A	2,4-dinitrophenol	ND
A	4,6-dinitro-o-cresol	ND
A	pentachlorophenol	ND
A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
B	hexachloroethane	ND
B	bis(2-chloroethyl)ether	ND
B	2-chloronaphthalene	ND
B	1,2-dichlorobenzene	ND
B	1,3-dichlorobenzene	ND
B	1,4-dichlorobenzene	*
B	3,3-dichlorobenzidine	ND
B	2,4-dinitrotoluene	ND
B	2,6-dinitrotoluene	ND
B	1,2-diphenylhydrazine	ND
B	fluoranthene	ND
B	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	ND
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	ND
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	*
678	butyl benzyl phthalate	ND
688	di-n-butyl phthalate	ND
698	di-n-octyl phthalate	ND
708	diethyl phthalate	*
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	ND
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: TMK

Checked by: C. Pelaez

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. SLE-2

CO I.D. 13-1255

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	ug/l
A	2,4,6-trichlorophenol	ND
A	p-chloro-m-cresol	ND
A	2-chlorophenol	ND
A	2,4-dichlorophenol	ND
A	2,4-dimethylphenol	ND
A	2-nitrophenol	ND
A	4-nitrophenol	ND
A	2,4-dinitrophenol	ND
A	4,6-dinitro-o-cresol	ND
A	pentachlorophenol	ND
	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
B	hexachloroethane	ND
B	bis(2-chloroethyl)ether	ND
B	2-chloronaphthalene	ND
B	1,2-dichlorobenzene	ND
B	1,3-dichlorobenzene	ND
B	1,4-dichlorobenzene	*
B	3,3-dichlorobenzidine	ND
B	2,4-dinitrotoluene	*
B	2,6-dinitrotoluene	ND
B	1,2-diphenylhydrazine	ND
B	fluoranthene	ND
	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	*
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	*
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT Geraghty & Miller

CLIENT I.D. LF-1

ERCO I.D. 13-1256

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	µg/l
	2,4,6-trichlorophenol	ND
	p-chloro-m-cresol	ND
	2-chlorophenol	ND
	2,4-dichlorophenol	ND
	2,4-dimethylphenol	ND
	2-nitrophenol	ND
	4-nitrophenol	ND
	2,4-dinitrophenol	ND
	4,6-dinitro-o-cresol	ND
	pentachlorophenol	ND
	phenol	ND

	BASE/NEUTRAL COMPOUNDS	µg/l
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
	hexachloroethane	ND
	bis(2-chloroethyl)ether	ND
	2-chloronaphthalene	ND
	1,2-dichlorobenzene	ND
	1,3-dichlorobenzene	ND
	1,4-dichlorobenzene	ND
	3,3-dichlorobenzidine	ND
	2,4-dinitrotoluene	ND
	2,6-dinitrotoluene	ND
	1,2-diphenylhydrazine	ND
	fluoranthene	ND
	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	µg/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	ND
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	*
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	
678	butyl benzyl phthalate	ND
688	di-n-butyl phthalate	*
698	di-n-octyl phthalate	ND
708	diethyl phthalate	*
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	ND
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

Checked by: C. Podgers

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

CLIENT Geraghty & Miller

CLIENT I.D. LF-3

LAB I.D. 13-1257

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

ACID COMPOUNDS	µg/l
2,4,6-trichlorophenol	ND
p-chloro-m-cresol	ND
2-chlorophenol	ND
2,4-dichlorophenol	ND
2,4-dimethylphenol	ND
2-nitrophenol	ND
4-nitrophenol	ND
2,4-dinitrophenol	ND
4,6-dinitro-o-cresol	ND
pentachlorophenol	ND
phenol	ND

BASE/NEUTRAL COMPOUNDS	
acenaphthene	ND
benzidine	ND
1,2,4-trichlorobenzene	ND
hexachlorobenzene	ND
hexachloroethane	ND
bis(2-chloroethyl)ether	ND
2-chloronaphthalene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND
3,3-dichlorobenzidine	ND
2,4-dinitrotoluene	ND
2,6-dinitrotoluene	ND
1,2-diphenylhydrazine	ND
fluoranthene	ND
4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	µg/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	ND
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	ND
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	18
678	butyl benzyl phthalate	ND
688	di-n-butyl phthalate	ND
698	di-n-octyl phthalate	ND
708	diethyl phthalate	*
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	ND
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. LF-4

DATE SAMPLE RECEIVED 2/17/82

:D I.D. 13-1258

DATE ANALYSIS COMPLETED 3/1/82

ACID COMPOUNDS	ug/l
2,4,6-trichlorophenol	ND
p-chloro-m-cresol	ND
2-chlorophenol	ND
2,4-dichlorophenol	ND
2,4-dimethylphenol	ND
2-nitrophenol	ND
4-nitrophenol	ND
2,4-dinitrophenol	ND
4,6-dinitro-o-cresol	ND
pentachlorophenol	ND
phenol	ND

BASE/NEUTRAL COMPOUNDS	
acenaphthene	ND
benzidine	ND
1,2,4-trichlorobenzene	ND
hexachlorobenzene	ND
hexachloroethane	ND
bis(2-chloroethyl)ether	ND
2-chloronaphthalene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND
3,3-dichlorobenzidine	ND
2,4-dinitrotoluene	ND
2,6-dinitrotoluene	ND
1,2-diphenylhydrazine	ND
fluoranthene	ND
4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	*
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	*
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

Checked by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

NT I.D. 15-6

CO I.D. 13-1248

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	ug/l
\	2,4,6-trichlorophenol	*
\	p-chloro-m-cresol	ND
\	2-chlorophenol	ND
\	2,4-dichlorophenol	*
\	2,4-dimethylphenol	ND
\	2-nitrophenol	ND
\	4-nitrophenol	ND
\	2,4-dinitrophenol	ND
\	4,6-dinitro-o-cresol	*
\	pentachlorophenol	15
	phenol	*

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
	hexachloroethane	ND
	bis(2-chloroethyl)ether	ND
	2-chloronaphthalene	ND
	1,2-dichlorobenzene	ND
	1,3-dichlorobenzene	ND
	1,4-dichlorobenzene	ND
	3,3-dichlorobenzidine	ND
	2,4-dinitrotoluene	ND
	2,6-dinitrotoluene	ND
	1,2-diphenylhydrazine	ND
	fluoranthene	ND
	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	*
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	ND
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	*
678	butyl benzyl phthalate	ND
688	di-n-butyl phthalate	*
698	di-n-octyl phthalate	ND
708	diethyl phthalate	*
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	*
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

.D = Not detected
\ = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. LF-7

CO I.D. 13-1249

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

ACID COMPOUNDS	ug/l
2,4,6-trichlorophenol	ND
p-chloro-m-cresol	ND
2-chlorophenol	ND
2,4-dichlorophenol	ND
2,4-dimethylphenol	ND
2-nitrophenol	ND
4-nitrophenol	ND
2,4-dinitrophenol	ND
4,6-dinitro-o-cresol	ND
pentachlorophenol	*
phenol	ND

BASE/NEUTRAL COMPOUNDS	
acenaphthene	ND
benzidine	ND
1,2,4-trichlorobenzene	ND
hexachlorobenzene	ND
hexachloroethane	ND
bis(2-chloroethyl)ether	ND
2-chloronaphthalene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	*
3,3-dichlorobenzidine	ND
2,4-dinitrotoluene	ND
2,6-dinitrotoluene	ND
1,2-diphenylhydrazine	ND
fluoranthene	ND
4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	ND
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	ND
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	90
678	butyl benzyl phthalate	
688	di-n-butyl phthalate	ND
698	di-n-octyl phthalate	ND
708	diethyl phthalate	*
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	ND
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

Checked by: C. Rodgers

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

NT I.D. LF-8

CO I.D. 13-1250

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

ACID COMPOUNDS	ug/l
2,4,6-trichlorophenol	ND
p-chloro-m-cresol	ND
2-chlorophenol	ND
2,4-dichlorophenol	ND
2,4-dimethylphenol	ND
2-nitrophenol	ND
4-nitrophenol	ND
2,4-dinitrophenol	ND
4,6-dinitro-o-cresol	ND
pentachlorophenol	ND
phenol	ND

BASE/NEUTRAL COMPOUNDS	
acenaphthene	ND
benzidine	ND
1,2,4-trichlorobenzene	ND
hexachlorobenzene	ND
hexachloroethane	ND
bis(2-chloroethyl)ether	ND
2-chloronaphthalene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND
3,3-dichlorobenzidine	ND
2,4-dinitrotoluene	ND
2,6-dinitrotoluene	ND
1,2-diphenylhydrazine	ND
fluoranthene	ND
4-chlorophenyl phenyl ether	ND

BASE NEUTRAL COMPOUNDS		ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	65
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	*
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	*
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
A = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. LF-9

CO I.D. 13-1251

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	ug/l
A	2,4,6-trichlorophenol	ND
A	p-chloro-m-cresol	ND
A	2-chlorophenol	ND
A	2,4-dichlorophenol	ND
A	2,4-dimethylphenol	ND
A	2-nitrophenol	ND
A	4-nitrophenol	ND
A	2,4-dinitrophenol	ND
A	4,6-dinitro-o-cresol	ND
A	pentachlorophenol	ND
A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
B	hexachloroethane	ND
B	bis(2-chloroethyl)ether	ND
B	2-chloronaphthalene	ND
B	1,2-dichlorobenzene	ND
B	1,3-dichlorobenzene	ND
B	1,4-dichlorobenzene	ND
B	3,3-dichlorobenzidine	ND
	2,4-dinitrotoluene	ND
B	2,6-dinitrotoluene	ND
B	1,2-diphenylhydrazine	ND
B	fluoranthene	ND
B	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	ug/l
418	4-bromophenyl phenyl ether	ND
428	bis(2-chloroisopropyl)ether	ND
438	bis(2-chloroethoxy)methane	ND
528	hexachlorobutadiene	ND
538	hexachlorocyclopentadiene	ND
548	isophorone	ND
558	naphthalene	ND
568	nitrobenzene	ND
618	N-nitrosodimethylamine	ND
628	N-nitrosodiphenylamine	ND
638	N-nitrosodi-n-propylamine	ND
668	bis(2-ethylhexyl)phthalate	
678	butyl benzyl phthalate	ND
688	di-n-butyl phthalate	ND
698	di-n-octyl phthalate	ND
708	diethyl phthalate	ND
718	dimethyl phthalate	ND
728	benzo(a)anthracene	ND
738	benzo(a)pyrene	ND
748	3,4-benzofluoranthene	ND
758	benzo(k)fluoranthene	ND
768	chrysene	ND
778	acenaphthylene	ND
788	anthracene	ND
798	benzo(ghi)perylene	ND
808	fluorene	ND
818	phenanthrene	ND
828	dibenzo(a,h)anthracene	ND
838	indeno(1,2,3-cd)pyrene	ND
848	pyrene	ND
1298	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

Checked by: C. [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IT I.D. LF-10

DATE SAMPLE RECEIVED 2/17/82

O I.D. 13-1252

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	µg/l
	2,4,6-trichlorophenol	ND
	p-chloro-m-cresol	ND
	2-chlorophenol	ND
	2,4-dichlorophenol	*
	2,4-dimethylphenol	ND
	2-nitrophenol	ND
	4-nitrophenol	ND
	2,4-dinitrophenol	ND
	4,6-dinitro-o-cresol	ND
	pentachlorophenol	ND
	enol	*

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	*
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
	hexachloroethane	ND
	bis(2-chloroethyl)ether	ND
	2-chloronaphthalene	ND
	1,2-dichlorobenzene	ND
	1,3-dichlorobenzene	ND
	1,4-dichlorobenzene	ND
	3,3-dichlorobenzidine	ND
	2,4-dinitrotoluene	ND
	2,6-dinitrotoluene	ND
	1,2-diphenylhydrazine	ND
	fluoranthene	ND
	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	µg/l
41B	4-bromophenyl phenyl ether	ND
42B	bis(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	23
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	*
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	*
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene /phenanthrene	*
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	See 78B
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
= Not applicable

* = 1-9 ug/l

Reported by: [illegible]

ENERGY RESOURCES CO. INC.
SUMMARY OF ORGANIC PRIORITY POLLUTANT ANALYSIS

IENT Geraghty & Miller

IENT I.D. Procedural Blank

CO I.D. 13-1253

DATE SAMPLE RECEIVED 2/17/82

DATE ANALYSIS COMPLETED 3/1/82

	ACID COMPOUNDS	µg/l
A	2,4,6-trichlorophenol	ND
A	p-chloro-m-cresol	ND
A	2-chlorophenol	ND
A	2,4-dichlorophenol	ND
A	2,4-dimethylphenol	ND
A	2-nitrophenol	ND
A	4-nitrophenol	ND
A	2,4-dinitrophenol	ND
A	4,6-dinitro-o-cresol	ND
A	pentachlorophenol	ND
A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	
	acenaphthene	ND
	benzidine	ND
	1,2,4-trichlorobenzene	ND
	hexachlorobenzene	ND
B	hexachloroethane	ND
B	bis(2-chloroethyl)ether	ND
B	2-chloronaphthalene	ND
B	1,2-dichlorobenzene	ND
B	1,3-dichlorobenzene	ND
B	1,4-dichlorobenzene	ND
B	3,3-dichlorobenzidine	ND
B	2,4-dinitrotoluene	ND
B	2,6-dinitrotoluene	ND
B	1,2-diphenylhydrazine	ND
B	fluoranthene	ND
B	4-chlorophenyl phenyl ether	ND

	BASE NEUTRAL COMPOUNDS	µg/l
41B	4-bromophenyl phenyl ether	ND
42B	bis(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	ND
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	ND
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	ND
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

ND = Not detected
NA = Not applicable
* = 1-9 ug/l

Reported by: [illegible]

Checked by: [illegible]

Sample Rcvd: 7/30/81
Date Analysis Completed: 8/7/81
All Results In: mg/l
Reported By:
Checked By:

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller

Compounds (in order of elution)	DLF-1	SLF-1	SLF-2
Vinyl chloride			
Methylene chloride		0.09	0.57
1,1-dichloroethylene			
1,1-dichloroethane			
trans-1,2-dichloroethylene			
1,2-dichloroethane			
1,1,1-trichloroethane			
1,2-Dichloropropane			
Trichloroethylene			
1,1,2-Trichloroethane			
Tetrachloroethylene			
Chlorobenzene			
Unknown			

Comments: All blank spaces are ND's (none detected) (<0.05 mg/l, or 50 ppb)

Sample Rcvd: 7/30/81

Date Analysis Completed: 8/7/81

All Results In: mg/l

Reported By:

Checked By:

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller

Compounds (in order of elution)	LF-1	LF-2	LF-3	LF-4	LF-5
Vinyl chloride					
Methylene chloride	0.07		0.22		
1,1-dichloroethylene					
1,1-dichloroethane					
trans-1,2-dichloroethylene					
1,2-dichloroethane					
1,1,1-trichloroethane					
1,2-Dichloropropane					
Trichloroethylene					
1,1,2-Trichloroethane					
Tetrachloroethylene					
Chlorobenzene		0.05			
Unknown					

Comments: All blank spaces are ND's (none detected) (<0.05 mg/l, or 50 ppb)

Sample Rcvd: 2/17/82

Date Analysis Completed: 3/15/82

All Results In: µg/l (ppb)

Reported By: [illegible]

Checked By: [illegible]

Analyzed for: G & M SC Navy

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Compounds (in order of elution)	LF-6 13-1248	LF-7 13-1249*	LF-8 13-1250	LF-9 13-1251	LF-10 13-1252**
Vinyl chloride		24			
Methylene chloride	3.2	2.2	650	1600	145
1,1-dichloroethylene					
1,1-dichloroethane					
1,2-dichloroethylene					
Chloroform	5.4	1.2	1.3	3.1	
1,2-dichloroethane					
1,1,1-trichloroethane					
Carbon tetrachloride					
Bromodichloromethane					
Trichloroethylene					
Dibromochloromethane			2.5	3.4	
Bromoform					
Tetrachloroethylene					

Comments: All blank spaces are ND's (none detected).
*2.9 ppb chlorobenzene
**~2 ppb. 1,2-dichloropropane (tentati· ID)

ENERGY RESOURCES CO. INC

PCB ANALYSIS

Sample Rcvd: 2/17/82

Date Analysis Completed: 3/22/82

All Results In: µg/l (ppb)

Reported By: [illegible]

Checked By: [illegible]

Analyzed for: Geraghty & Miller

Client ID:		LF-6	LF-7	LF-8	LF-9	LF-10	Procedural Blank	SLF-1	SLF-2	LF-1	LF-3	LF-4
	DET. LIMIT	13-1248	13-1249	13-1250	13-1251	13-1252	13-1253	13-1254	13-1255	13-1256	13-1257	13-1258
Aroclor 1221	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1016	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.1	0.1	ND	<.1	ND	ND	ND	ND	<.1	<.1	ND	ND
Aroclor 1260	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1262	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Comments:

ND = not detected.

pH MEASUREMENTS OF WATER SAMPLES
COLLECTED FROM MONITOR WELLS
AT THE LANDFILL AREA[1]

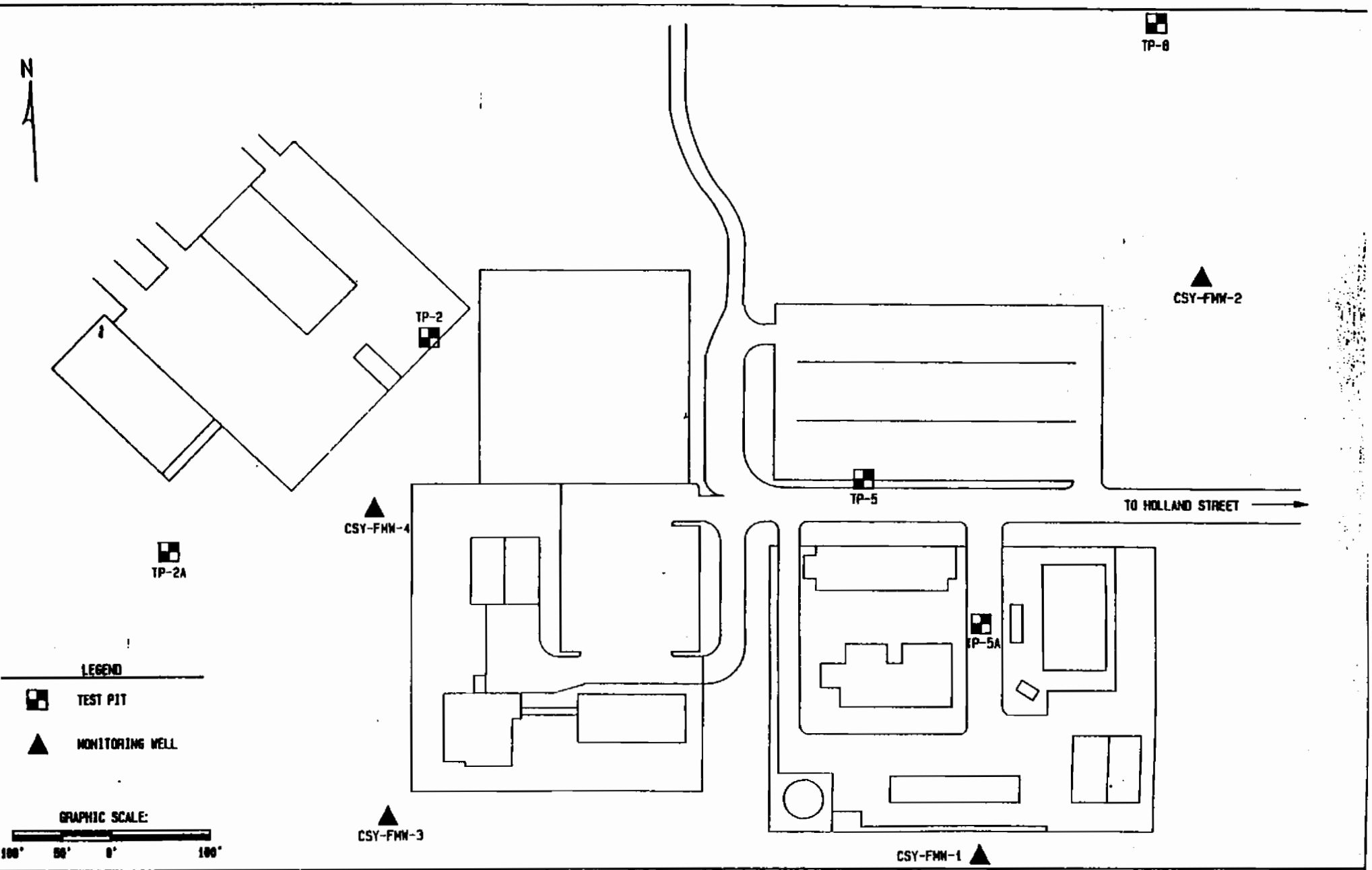
Well Number	pH 7/28/81	pH 2/15/82
LF-1	7.40	7.20
LF-2	7.55	-
LF-3	7.40	7.39
LF-4	7.35	7.32
LF-5	7.80	-
LF-6	-	8.02
LF-7	-	7.02
LF-8	-	7.50
LF-9	-	7.19
LF-10	-	8.74
SLF-1	-	7.04
SLF-2	7.70	7.42
DLF-1	8.85	-

[1] Measured at the time of sample collection.

APPENDIX I-2

Closed Landfill - Test Pit Observations/Logs and Analytical Data

(Source - Reference 17)



1" = 100'	DRAWN BY: WJM	REVISION DATE:	Westinghouse Environmental and Geotechnical Services, Inc. 840 Low Country Boulevard Mt. Pleasant, South Carolina 29646 (803) 884-8005	TITLE: SITE PLAN CHARLESTON NAVAL BASE ADVANCED FIRE FIGHTING CHARLESTON, SOUTH CAROLINA	FIGURE: 2
4-18-91	CHECKED BY:	REVISION DATE:			
CSWA219	APPROVED BY:	REVISION DATE:			

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Ground Water Protection Division 2600 Bull Street Columbia, S.C. 29201 (803) 758-5213 Water Well Record

1. LOCATION OF WELL

County: Charleston System Name: CSY-FMW-3

Latitude: 32° 51' Longitude: 79° 57'

Distance And Direction from Road Intersections

1700' southwest of Bainbridge and Holland

Street address & City of Well Location

Sketch Map: (See example on back)

See Attached

2. CUTTING SAMPLES [x] Yes [ ] No

Geophysical Logs [ ] Yes (Please enclose) [x] No

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
rown Silty Sand	.5'	.5'
Gray Sandy Clay	1.5'	2'
Brown Silty Clay	3.5'	5.5'
Gray Clay	2'	7.5'

ndicate water bearing zones

1.2' - 5.5+

(use a 2nd sheet if needed)

3. REMARKS

4. OWNER OF WELL

Address Charleston Naval Base

Telephone No.

Engineer Address Saussy Engineering
230 Habersham Street
Savannah, GA 31412 (912) 223-5103

Telephone No

5. WELL DEPTH (Completed) 5.5 ft. Date Started 04-11-91 Date Completed 04-11-91

6. [ ] Mud Rotary [ ] Jetted [x] Bored [ ] Dug
[ ] Air Rotary [ ] Driven [ ] Cable tool [ ] Other

7. USE: [ ] Domestic [ ] Public Supply Permit No ____ [ ] Indus
[ ] Irrigation [ ] Air Conditioning [ ] Comm
[x] Test Well [ ] ____

8. CASING: [x] Threaded [ ] Welded

Diam ____

Type [X] PVC [ ] Galvanized
[ ] Steel [ ] Other

2 in to .5 ft. depth

____ in to ____ ft. depth

Height Above/Below Surface 0 ft

Weight ____ lbs/ft

Drive Shoe? [ ] Yes [ ] No

9. SCREEN

Type PVC Diam 2"

Slot/Gauze 10 Length 5'

Set Between .5 ft. and 5.5 ft

____ ft. and ____ ft

NOTE: MULTIPLE SCRE USE SECOND SHEET

Sieve Analysis [ ] Yes (Please enclose) [X] No

10. STATIC WATER LEVEL

1.2' ft. below land surface after 24 hours

11. PUMPING LEVEL Below Land Surface

____ ft. after ____ hrs. pumping ____ G.P.M.

Pumping Test [ ] Yes (Please enclose) [X] No

Yield ____

12. WATER QUALITY

Chemical Analysis [X] Yes [ ] No Bacterial Analysis [ ] Yes [X] No

Please Enclose Lab Results

13. ARTIFICIAL FILTER (Gravel Pack) [X] Yes [ ] No

Installed from .5 ft. to 5.5 ft.

Effective size 0.513 uniformity coefficient 1.466

14. WELL GROUTED? [X] Yes [ ] No

Neat Cement [ ] Sand Cement [ ] Concrete [X] Other [X] Bentonit

Depth From 0.5 ft. to surface

15. NEAREST SOURCE OF POSSIBLE CONTAMINATION: ____ Feet ____ Direction

____ Type Well disinfected upon completion [ ] Yes [ ] No Type ____ Amount ____

16. PUMP Date Installed ____ not installed [X]

Mfr. name ____ model no ____

H.P ____ volts ____ length of drop pipe ____ ft. capacity ____

TYPE: [ ] Submersible [ ] Jet (shallow) [ ] Turbine
[ ] Jet (deep) [ ] Reciprocating [ ] Centrifugal

17. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my direct and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME Hardin-Huber ADDRESS 1053 E. Lindsay S Greensboro, NC 27

Drill Force

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Ground Water Protection Division 2600 Bull Street Columbia, S.C. 29201 (803) 758-5213 Water Well Record

1. LOCATION OF WELL

County: Charleston System Name: CSY-FMW-4

Latitude: 32° 51' Longitude: 79° 57'

Distance And Direction from Road Intersections: 1500' soutwest of Bainbridge and Holland

Street address & City of Well Location

Sketch Map: (See example on back)

See Attached

2. CUTTING SAMPLES [x] Yes [ ] No

Geophysical Logs [ ] Yes (Please enclose) [x] No

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Silty Sand	5'	5'
(w/tar beween 2-3.5')		
Light Brown Sandy Clay	2.5'	7.5'
With Organics		

* Indicate water bearing zones
1.75' - 7.5'+
(use a 2nd sheet if needed)

3. REMARKS

4. OWNER OF WELL

Address: Charleston Naval Base

Telephone No

Engineer Address: Saussy Engineering, 230 Habersham Street, Savannah, GA 31412 (912) 223-5103

Telephone No

5. WELL DEPTH (Completed) 7.5 ft. Date Started 04-11-91 Date Completed 04-11-91

6. [ ] Mud Rotary [ ] Jetted [x] Bored [ ] Dug [ ] Air Rotary [ ] Driven [ ] Cable tool [ ] Other

7. USE: [ ] Domestic [ ] Public Supply Permit No [ ] Irrigation [ ] Air Conditioning [ ] Test Well [ ]

8. CASING [x] Threaded [ ] Welded

Diam. Type [x] PVC [ ] Galvanized [ ] Steel [ ] Other

2 in. to 2.5 ft. depth

Height Above/Below Surface 0 ft. Weight lbs. Drive Shoe? [ ] Yes [x] No

9. SCREEN Type PVC Diam. 2" Slot/Gauge 10 Length 5'

Set Between 2.5 ft. and 7.5 ft. NOTE: MULTIPLE SCREENS USE SECOND SHEET

Sieve Analysis [ ] Yes (Please enclose) [x] No

10. STATIC WATER LEVEL 1.75 ft. below land surface after 24 hours

11. PUMPING LEVEL Below Land Surface ft. after hrs. pumping GPM

Pumping Test [ ] Yes (Please enclose) [x] No

Yield

12. WATER QUALITY

Chemical Analysis [x] Yes [ ] No Bacterial Analysis [ ] Yes [x] No

Please Enclose Lab Results

13. ARTIFICIAL FILTER (Gravel Pack) [x] Yes [ ] No

Installed from 1.5 ft. to 7.5 ft.

Effective size uniformity coefficient 1.466

14. WELL GROUTED? [ ] Yes [ ] No

Neat Cement [ ] Sand Cement [ ] Concrete [ ] Other [x] Bentonit

Depth From 1.5 ft. to surface

15. NEAREST SOURCE OF POSSIBLE CONTAMINATION Feet Direction Type Well disinfected upon completion [ ] Yes Type [ ] No Amount

16. PUMP Date Installed not installed [x]

Mfr. name model no.

H.P. volts length of drop pipe ft. capacity g

TYPE: [ ] Submersible [ ] Jet (shallow) [ ] Turbine [ ] Jet (deep) [ ] Reciprocating [ ] Centrifugal

17. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME Hardin-Huber ADDRESS 1053 E. Lindsay S Greensboro, NC 27

855

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Ground Water Protection Division 2600 Bull Street Columbia, S.C. 29201 (803) 758-5213 Water Well Record

LOCATION OF WELL

County: Charleston System Name: CSY-FMW-2

Latitude: 32° 51' Longitude: 79° 57'

Distance And Direction from Road Intersections

800' south of Holland and Bainbridge

Street address & City of Well Location

Sketch Map: (See example on back)

See Attached

2. CUTTING SAMPLES [x] Yes [ ] No

Geophysical Logs [ ] Yes (Please enclose) [x] No

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
rown-Black Silty Sand	3'	3'
(Topsoil)		
Tar, Trash, Sand	4.5	7.5

Indicate water bearing zones

3.45' - 7.5+

(use a 2nd sheet if needed)

3. REMARKS

4. OWNER OF WELL

Address Charleston Naval Base

Telephone No.

Engineer Address Saussy Engineering
230 Habersham Street
Savannah, GA 31412 (912) 223-5103

Telephone No.

5. WELL DEPTH (Completed) 7.5 ft. Date Started 04-11-91 Date Completed 04-11-91

6. [ ] Mud Rotary [ ] Jetted [x] Bored [ ] Dug [ ] Air Rotary [ ] Driven [ ] Cable tool [ ] Other

7. USE. [ ] Domestic [ ] Public Supply Permit No. [ ] Industrial [ ] Irrigation [ ] Air Conditioning [ ] Commercial [x] Test Well [ ]

8. CASING [x] Threaded [ ] Welded

Diam.

Type [x] PVC [ ] Galvanized [ ] Steel [ ] Other

2 in. to 2.5 ft. depth

in. to ft. depth

Height Above/Below Surface 0 ft.

Weight lbs. ft.

Drive Shoe? [ ] Yes [x] No

9. SCREEN

Type PVC Diam. 2"

Slot/Gauze 10 Length 5'

Set Between 2.5 ft. and 7.5 ft. NOTE: MULTIPLE SCREE USE SECOND SHEET

ft. and ft.

Sieve Analysis [ ] Yes (Please enclose) [x] No

10. STATIC WATER LEVEL

3.45' ft. below land surface after 24 hours

11. PUMPING LEVEL Below Land Surface

ft. after hrs. pumping G.P.M.

Pumping Test [ ] Yes (Please enclose) [x] No

Yield

12. WATER QUALITY

Chemical Analysis [x] Yes [ ] No Bacterial Analysis [ ] Yes [x] No

Please Enclose Lab Results

13. ARTIFICIAL FILTER (Gravel Pack) [x] Yes [ ] No

Installed from 1.5 ft. to 7.5 ft.

Effective size uniformity coefficient 1.466

14. WELL GROUTED? [ ] Yes [ ] No

Neat Cement [ ] Sand Cement [ ] Concrete [x] Other [x] Bentonite

Depth From ft. to ft.

15. NEAREST SOURCE OF POSSIBLE CONTAMINATION Feet Direction

Type Well disinfected upon completion [ ] Yes Type [ ] No Amount

16. PUMP Date Installed not installed [x]

Mfr. name Model no.

H.P. volts length of drop pipe ft. capacity g.p.m.

TYPE: [ ] Submersible [ ] Jet (shallow) [ ] Turbine [ ] Jet (deep) [ ] Reciprocating [ ] Centrifugal

17. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my direction and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME Hardin-Huber ADDRESS 1053 E. Lindsay S Greensboro, NC 27

... AND ENVIRONMENTAL CONTROL

Ground Water Protection Division 2600 Bull Street Columbia, S.C. 29201 (803) 758-5213 Water Well Record

1. LOCATION OF WELL

County: Charleston System Name: CSY-FMW-1

Latitude: 32° 51' Longitude: 79° 57'

Distance And Direction from Road Intersections

1500' south of Holland and Bainbridge

Street address & City of Well Location

Sketch Map (See example on back)

See Attached

2. CUTTING SAMPLES [x] Yes [ ] No

Geophysical Logs [ ] Yes (Please enclose) [x] No

FORMATION DESCRIPTION	*THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Brown Silty Sand	3'	3'
Black Silty Clay	4.5+	7.5

* Indicate water bearing zones

1.75' - 7.5'+

(use a 2nd sheet if needed)

3. REMARKS

4. OWNER OF WELL

Address Charleston Naval Base

Telephone No

Engineer

Address Sa..ssy Engineering
230 Habersham Street
Savannah, GA 31412 (912) 223-5103

Telephone No

5. WELL DEPTH (Completed) 7.5 ft. Date Started 04-11-91 Date Completed 04-11-91

6. [ ] Mud Rotary [ ] Jetted [x] Bored [ ] Dug
[ ] Air Rotary [ ] Driven [ ] Cable tool [ ] Other

7. USE: [ ] Domestic [ ] Public Supply Permit No ____ [ ] Industry
[ ] Irrigation [ ] Air Conditioning [ ] Commer.
[x] Test Well [ ] ____

8. CASING: [x] Threaded [ ] Welded

Diam.

Type: [x] PVC [ ] Galvanized
[ ] Steel [ ] Other

2 in. to 2.5 ft. depth

____ in. to ____ ft. depth

Height Above/Below Surface 0 ft

Weight ____ lbs/ft

Drive Shoe? [ ] Yes [x] No

9. SCREEN

Type PVC Diam. 2"

Slot/Gauge 10 Length 5'

Set Between 2.5 ft. and 7.5 ft.

____ ft. and ____ ft.

NOTE: MULTIPLE SCREEN USE SECOND SHEET

Sieve Analysis [ ] Yes (Please enclose) [x] No

10. STATIC WATER LEVEL

1.75 ft. below land surface after 24 hours

11. PUMPING LEVEL Below Land Surface

____ ft. after ____ hrs. pumping ____ G.P.M.

Pumping Test [ ] Yes (Please enclose) [x] No

Yield ____

12. WATER QUALITY

Chemical Analysis [x] Yes [ ] No Bacterial Analysis [ ] Yes [x] No

Please Enclose Lab Results

13. ARTIFICIAL FILTER (Gravel Pack) [x] Yes [ ] No

Installed from 1.5 ft. to 7.5 ft.

Effective size ____ uniformity coefficient 1.466

14. WELL GROUTED? [ ] Yes [ ] No

Neat Cement [ ] Sand Cement [ ] Concrete [x] Other [x] Bentonite

Depth From 1.5 ft. to surface ft.

15. NEAREST SOURCE OF POSSIBLE CONTAMINATION ____ Feet ____ Direction

____ Type Well disinfected upon completion [ ] Yes [ ] No Type ____ Amount ____

16. PUMP Date Installed ____ not installed [x]

Mfr. name ____ model no. ____

H.P. ____ volts ____ length of drop pipe ____ ft. capacity ____ gpm

TYPE: [ ] Submersible [ ] Jet (shallow) [ ] Turbine
[ ] Jet (deep) [ ] Reciprocating [ ] Centrifugal

17. WATER WELL CONTRACTOR'S CERTIFICATION: This well was drilled under my ... and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME Hardin-Huber ADDRESS 1053 E. Lindsa... Greensboro, NC 2740

Signed For Robert Fowler CERT. NO. 855

Date 5/15/91

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	TP-2/TRAIN. CNT.	EPA:	# FL095
SAMPLE NUMBER	002-041291	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/12/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/11/91	GEORGIA:	# 828
SAMPLE TYPE	SOIL	SOUTH CAROLINA:	# 96015
SUBMITTER	DIRECT EXPRESS		

TEST		RESULTS	
LEAD,T	3050/7421	170.0	MG/KG D.W.
ARSENIC,T	3050/7060	4.60	MG/KG D.W.
BARIUM,T	3050/7080	35.	MG/KG D.W.
CADMIUM,T	3050/7131	.20	MG/KG D.W.
CHROMIUM,T	3050/7191	11.0	MG/KG D.W.
SELENIUM,T	3050/7740	.20	MG/KG D.W.
MERCURY,T	7471	<0.1	MG/KG D.W.
SILVER,T	3050/7760	<0.1	MG/KG D.W.
EPA 8240		NEGATIVE	
EPA 8270		POSITIVE	
pH OF SOLID	9045	8.0	

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE
SAMPLE: 002-041291/ TP-2 TRAIN. CNT. #219
DATA FILE: >41615::D4
DATE REPORTED: 4/17/91 2:28
DILUTION FACT: 5.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8240
PURGEABLE ORGANICS - SOILS -

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)	CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg
67-64-1	ACETONE	0.0	5.00	95-50-1	o-DICHLOROBENZENE	0.0	1.00
75-05-8	ACETONITRILE	0.0	10.0	541-73-1	m-DICHLOROBENZENE	0.0	1.00
107-02-8	ACROLEIN	0.0	80.0	106-46-7	p-DICHLOROBENZENE	0.0	1.00
107-13-1	ACRYLONITRILE	0.0	20.0	156-60-5	trans,1,2-DICHLOROETHENE	0.0	1.00
71-43-2	BENZENE	0.0	1.00	78-87-5	1,2-DICHLOROPROPANE	0.0	1.00
100-44-7	BENZYL CHLORIDE	0.0	1.00	10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	1.00
75-27-4	BROMODICHLOROMETHANE	0.0	1.00	10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	1.00
75-25-2	BROMOFORM	0.0	1.00	100-41-4	ETHYLBENZENE	0.0	1.00
74-83-9	BROMOMETHANE	0.0	5.00	591-78-6	HEXANE	0.0	1.00
78-93-3	2-BUTANONE (MEK)	0.0	10.0	78-83-1	ISOBUTYL ALCOHOL	0.0	20.0
75-15-0	CARBON DISULFIDE	0.0	5.00	75-09-2	METHYLENE CHLORIDE	0.0	5.00
56-23-53	CARBON TETRACHLORIDE	0.0	1.00	108-10-1	4-METHYL-2-PENTANONE	0.0	10.0
108-90-7	CHLOROBENZENE	0.0	1.00	109-06-8	2-PICOLINE	0.0	
124-48-1	CHLORODIBROMOMETHANE	0.0	1.00	110-86-1	PYRIDINE	0.0	
75-00-3	CHLOROETHANE	0.0	5.00	100-42-5	STYRENE	0.0	1.00
110-75-8	2-CHLOROETHYLVINYLETHER	0.0	5.00	630-20-6	1,1,1,2-TETRACHLOROETHANE	0.0	1.00
67-66-3	CHLOROFORM	0.0	1.00	79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	1.00
74-87-3	CHLOROMETHANE	0.0	1.00	127-18-4	TETRACHLOROETHENE	0.0	1.00
96-12-8	1,2-DIBROMO-3-CHLOROPRO	0.0	1.00	108-88-3	TOLUENE	0.0	1.00
106-93-4	1,2-DIBROMOETHANE	0.0	1.00	71-55-6	1,1,1-TRICHLOROETHANE	0.0	1.00
74-95-3	DIBROMOMETHANE	0.0	1.00	79-00-5	1,1,2-TRICHLOROETHANE	0.0	1.00
764-41-0	1,4-DICHLORO-2-BUTENE	0.0	5.00	79-01-6	TRICHLOROETHENE	0.0	1.00
75-71-8	DICHLORODIFLUOROMETHANE	0.0	5.00	75-69-4	TRICHLOROFLUOROMETHANE	0.0	5.00
75-34-3	1,1-DICHLOROETHANE	0.0	1.00	96-18-4	1,2,3-TRICHLOROPROPANE	0.0	1.00
107-06-2	1,2-DICHLOROETHANE	0.0	1.00	108-05-4	VINYL ACETATE	0.0	5.00
75-35-4	1,1-DICHLOROETHENE	0.0	1.00	75-01-4	VINYL CHLORIDE	0.0	1.00
				1330-20-7	TOTAL XYLENES	0.0	1.00

KYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FA
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 002-041291/ TP-2 TRAIN CNT #219
DATA FILE: >4B11A::D3
DATE REPORTED: 4/17/91 2:37
DILUTION FACT: 100.0000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
83-32-9	ACENAPHTHENE	BMDL	0.50
208-96-8	ACENAPHTHYLENE	BMDL	0.50
98-86-2	ACETOPHENONE	BMDL	0.50
309-00-2	ALDRIN	BMDL	0.50
101-05-3	ANILAZINE	BMDL	10.0
62-53-3	ANILINE	BMDL	0.75
120-12-7	ANTHRACENE	BMDL	1.00
12674-11-2	AROCHLOR-1016	BMDL	5.00
11104-28-2	AROCHLOR-1221	BMDL	5.00
11141-16-5	AROCHLOR-1232	BMDL	5.00
53469-21-9	AROCHLOR-1242	BMDL	5.00
12672-29-6	AROCHLOR-1248	BMDL	5.00
11097-69-1	AROCHLOR-1254	BMDL	5.00
11096-82-5	AROCHLOR-1260	BMDL	5.00
86-50-0	AZINPHOS METHYL "GUTHION"	BMDL	5.00
01-27-9	BARBAN	BMDL	5.00
2-87-5	BENZIDINE	BMDL	20.0
65-85-0	BENZOIC ACID	BMDL	25.0
56-55-3	BENZO(a)ANTHRACENE	BMDL	0.75
205-99-2	BENZO(b)FLUORANTHENE	BMDL	0.75
207-08-9	BENZO(k)FLUORANTHENE	BMDL	1.00
191-24-2	BENZO(ghi)PERYLENE	BMDL	0.85
50-32-8	BENZO(a)PYRENE	BMDL	1.00
106-51-4	p-BENZOQUINONE	BMDL	1.00
100-51-6	BENZYL ALCOHOL	BMDL	1.00
319-84-6	BHC-alpha	BMDL	1.00
319-85-7	BHC-beta	BMDL	1.00
319-86-8	BHC-delta	BMDL	1.00
58-89-9	BHC-gamma "LINDANE"	BMDL	1.00
111-91-1	BIS(2-CHLOROETHOXY)METHANE	BMDL	1.00
111-44-4	BIS(2-CHLOROETHYL)ETHER	BMDL	1.00
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	BMDL	1.00
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	BMDL	1.00
101-55-3	4-BROMODIPHENYLETHER	BMDL	0.50
1689-84-5	BROMOXYNIL	BMDL	5.00
85-68-7	BUTYLBENZYLPHTHALATE	3580	1.00
2425-06-1	CAPTAFOL	BMDL	5.00
133-06-2	CAPTAN	BMDL	2.50
63-25-2	CARBARYL	BMDL	1.00
1563-66-2	CARBOFURAN	BMDL	1.00
786-19-6	CARBOPHENOTHION	BMDL	1.50
57-74-9	CHLORDANE	BMDL	5.00
470-90-6	CHLORFEVINPHOS	BMDL	1.00
106-47-8	4-CHLOROANILINE	BMDL	2.50
510-15-6	CHLOROBENZILATE	BMDL	1.00
59-50-7	4-CHLORO-3-METHYLPHENOL	BMDL	10.0
91-58-7	2-CHLORONAPHTHALENE	BMDL	1.00
95-57-8	2-CHLOROPHENOL	BMDL	1.00
05-72-3	4-CHLORODIPHENYLETHER	BMDL	1.00
8-01-9	CHRYSENE	BMDL	2.50
6-72-4	COUMAPHOS	BMDL	2.50
7700-17-6	CROTOXYPHOS	BMDL	5.00
72-54-8	p'p'-DDD	BMDL	1.00
72-55-9	p'p'-DDE	BMDL	1.00
50-29-3	p'p'-DDT	BMDL	5.00

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
298-03-3	DEMETON-o	BMDL	1.00
126-75-0	DEMETON-s	BMDL	1.00
2303-16-4	cis-DIALLATE	BMDL	1.00
2303-16-4	trans-DIALLATE	BMDL	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	BMDL	1.00
132-64-9	DIBENZOFURAN	BMDL	1.00
84-74-2	DI-n-BUTYLPHTHALATE	BMDL	1.00
117-80-6	DICHLONE	BMDL	5.00
95-50-1	1,2-DICHLOROBENZENE	BMDL	1.00
541-73-1	1,3-DICHLOROBENZENE	BMDL	1.00
106-46-7	1,4-DICHLOROBENZENE	BMDL	1.00
91-94-1	3,3-DICHLOROBENZIDINE	BMDL	20.0
120-83-2	2,4-DICHLOROPHENOL	BMDL	20.0
62-73-7	DICHLORVOS	BMDL	5.00
141-66-2	DICROTOPHOS	BMDL	5.00
60-57-1	DIELDRIN	BMDL	2.50
84-66-2	DIETHYLPHTHALATE	BMDL	1.00
60-51-5	DIMETHOATE	BMDL	2.50
105-67-9	2,4-DIMETHYLPHENOL	BMDL	2.00
131-11-3	DIMETHYLPHTHALATE	BMDL	1.00
528-29-0	m-DINITROBENZENE	BMDL	10.0
534-52-1	4,6-DINITRO-2-METHYLPHENOL	BMDL	40.0
51-28-5	2,4-DINITROPHENOL	BMDL	10.0
121-14-2	2,4-DINITROTOLUENE	BMDL	10.0
606-20-2	2,6-DINITROTOLUENE	BMDL	10.0
88-85-7	DINOSEB	BMDL	5.00
122-39-4	DIPHENYLAMINE	BMDL	2.50
122-66-7	1,2-DIPHENYLHYDRAZINE	BMDL	5.00
117-84-0	DI-n-OCTYLPHTHALATE	BMDL	5.00
298-04-4	DISULFOTON	BMDL	1.00
959-98-8	ENDOSULFAN I	BMDL	5.00
33212-65-9	ENDOSULFAN II	BMDL	5.00
1031-07-8	ENDOSULFAN SULFATE	BMDL	5.00
72-20-8	ENDRIN	BMDL	5.00
	ENDRIN KETONE	BMDL	1.00
2104-64-5	EPN	BMDL	1.00
563-12-2	ETHION	BMDL	1.00
52-85-7	FAMPHUR	BMDL	1.00
55-38-9	FENTHION	BMDL	1.00
33245-39-5	FLUCHLORALIN	BMDL	1.00
86-73-7	FLUORENE	BMDL	1.00
76-44-8	HEPATACHLOR	BMDL	1.00
1024-57-3	HEPTACHLOR EPOXIDE	BMDL	1.00
118-74-1	HEXACHLOROBENZENE	BMDL	1.00
87-68-3	HEXACHLOROBUTADIENE	BMDL	1.00
77-47-4	HEXACHLOROCYCLOPENTADIENE	BMDL	1.00
67-72-1	HEXACHLOROETHANE	BMDL	1.00
123-31-9	HYDROQUINONE	BMDL	1.00
193-39-5	INDENO(1,2,3-cd)PYRENE	BMDL	1.00
465-73-6	ISODRIN	BMDL	1.00
78-59-1	ISOPHORONE	BMDL	1.00
143-50-0	KEPONE	BMDL	1.00
21609-90-5	LEPTOPHOS	BMDL	1.00

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 002-041291/ TP-2 TRAIN CNT #219
DATA FILE: >4B11A::D3

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
72-43-5	METHOXYCHLOR-p'p'	BMDL	5.00
90-12-0	1-METHYLNAPHTHALENE	380	1.00
91-57-6	2-METHYLNAPHTHALENE	560	1.00
298-00-0	METHYL PARATHION	BMDL	1.00
95-48-7	2-METHYLPHENOL "o-CRESOL"	BMDL	5.00
108-39-4	3-METHYLPHENOL "m-CRESOL"	BMDL	5.00
106-44-5	4-METHYLPHENOL "p-CRESOL"	BMDL	5.00
7786-34-7	MEVINPHOS	BMDL	1.00
2385-85-5	MIREX	BMDL	5.00
6923-22-4	MONOCROTOPHOS	BMDL	5.00
300-76-5	NALED	BMDL	5.00
91-20-3	NAPHTHALENE	400	1.00
130-15-4	1,4-NAPHTHOQUINONE	BMDL	5.00
54-11-5	NICOTINE	BMDL	10.0
98-95-3	NITROBENZENE	BMDL	5.00
1836-75-5	NITROFEN	BMDL	5.00
88-75-5	2-NITROPHENOL	BMDL	5.00
100-02-7	4-NITROPHENOL	BMDL	5.00
62-75-9	n-NITROSODIMETHYLAMINE	BMDL	10.0
86-30-6	n-NITROSODIPHENYLAMINE	BMDL	10.0
621-64-7	n-NITROSODI-n-PROPYLAMINE	BMDL	10.0
56-38-2	PARATHION	BMDL	1.00
82-68-3	PENTACHLORONITROBENZENE	BMDL	1.00
87-86-5	PENTACHLOROPHENOL	BMDL	5.00
85-01-8	PHENANTHRENE	BMDL	1.00
108-95-2	PHENOL	BMDL	1.00
298-02-2	PHORATE	BMDL	1.00
732-11-6	PHOSMET	BMDL	1.00
13171-21-6	PHOSPHAMIDON	BMDL	5.00
109-06-8	2-PICOLINE	BMDL	10.0
23950-58-5	PRONAMIDE	BMDL	1.00
129-00-0	PYRENE	500	1.00
110-86-1	PYRIDINE	BMDL	10.0
13071-79-9	TERBUFOS	BMDL	5.00
95-94-3	1,2,4,5-TETRACHLOROBENZENE	BMDL	1.00
961-11-5	TETRACHLORVINPHOS	BMDL	5.00
8001-35-2	TOXAPHENE	BMDL	5.00
120-82-1	1,2,4-TRICHLOROBENZENE	BMDL	2.50
95-95-4	2,4,5-TRICHLOROPHENOL	BMDL	1.00
88-06-2	2,4,6-TRICHLOROPHENOL	BMDL	1.00
1582-09-8	TRIFLURALIN	BMDL	1.50

MISCELLANEOUS ANALYTES

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
30560-19-1	ACEPHATE	BMDL	10.0
76-06-2	CHLORPICRIN	BMDL	5.00
2675-77-6	CHLORNEB	BMDL	1.00
5598-13-0	CHLORPYRIFOS "DURSBAN"	BMDL	1.00
99-30-9	DICHLORAN "BOTRAN"	BMDL	1.00
333-41-5	DIAZINON	BMDL	1.00
120-36-5	DICHLORPROP	BMDL	10.0
957-51-7	DIPHENAMID	BMDL	1.00
25311-71-1	ISOFENPHOS	BMDL	5.00
150-50-5	MERPHOS	BMDL	1.00
114-26-1	PROPUXUR	BMDL	5.00
206-44-0	FLUORANTHENE	590	1.00

BMDL = BELOW METHOD DETECTION LIMIT
ACTUAL METHOD DETECTION LIMIT = DILUTION FACTOR x MDL

LYLE A. JOHNSON - Chemist

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	TP-5/TRAIN. CNT.	EPA:	# FL095
SAMPLE NUMBER	003-041291	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/12/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/11/91	GEORGIA:	# 828
SAMPLE TYPE	SOIL	SOUTH CAROLINA:	# 96015
SUBMITTER	DIRECT EXPRESS		

TEST		RESULTS	
LEAD,T	3050/7421	15.0	MG/KG D.W.
ARSENIC,T	3050/7060	.40	MG/KG D.W.
BARIUM,T	3050/7080	<5.0	MG/KG D.W.
CADMIUM,T	3050/7131	.20	MG/KG D.W.
CHROMIUM,T	3050/7191	3.5	MG/KG D.W.
SELENIUM,T	3050/7740	.30	MG/KG D.W.
MERCURY,T	7471	<0.1	MG/KG D.W.
SILVER,T	3050/7760	<0.1	MG/KG D.W.
EPA 8240		POSITIVE	
EPA 8270		POSITIVE	
pH OF SOLID	9045	7.1	

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE
SAMPLE: 003-041291/ TP-5 TRAIN. CNT. #219
DATA FILE: >41616::D4
DATE REPORTED: 4/17/91 3:25
DILUTION FACT: 5.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8240
PURGEABLE ORGANICS - SOILS -

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)	CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
67-64-1	ACETONE	0.0	5.00	95-50-1	o-DICHLOROBENZENE	0.0	1.00
75-05-8	ACETONITRILE	0.0	10.0	541-73-1	m-DICHLOROBENZENE	0.0	1.00
107-02-8	ACROLEIN	0.0	80.0	106-46-7	p-DICHLOROBENZENE	17.9	1.00
107-13-1	ACRYLONITRILE	0.0	20.0	156-60-5	trans,1,2-DICHLOROETHENE	0.0	1.00
71-43-2	BENZENE	0.0	1.00	78-87-5	1,2-DICHLOROPROPANE	0.0	1.00
100-44-7	BENZYL CHLORIDE	0.0	1.00	10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	1.00
75-27-4	BROMODICHLOROMETHANE	0.0	1.00	10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	1.00
75-25-2	BROMOFORM	0.0	1.00	100-41-4	ETHYLBENZENE	0.0	1.00
74-83-9	BROMOMETHANE	0.0	5.00	591-78-6	HEXANE	0.0	1.00
78-93-3	2-BUTANONE (MEK)	0.0	10.0	78-83-1	ISOBUTYL ALCOHOL	0.0	20.0
75-15-0	CARBON DISULFIDE	0.0	5.00	75-09-2	METHYLENE CHLORIDE	0.0	5.00
56-23-53	CARBON TETRACHLORIDE	0.0	1.00	108-10-1	4-METHYL-2-PENTANONE	0.0	10.0
108-90-7	CHLOROBENZENE	0.0	1.00	109-06-8	2-PICOLINE	0.0	[illegible]
124-48-1	CHLORODIBROMOMETHANE	0.0	1.00	110-86-1	PYRIDINE	0.0	
75-00-3	CHLOROETHANE	0.0	5.00	100-42-5	STYRENE	0.0	[illegible]
110-75-8	2-CHLOROETHYLVINYLETHER	0.0	5.00	630-20-6	1,1,1,2-TETRACHLOROETHANE	0.0	1.00
67-66-3	CHLOROFORM	0.0	1.00	79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	1.00
74-87-3	CHLOROMETHANE	0.0	1.00	127-18-4	TETRACHLOROETHENE	0.0	1.00
96-12-8	1,2-DIBROMO-3-CHLOROPRO	0.0	1.00	108-88-3	TOLUENE	0.0	1.00
106-93-4	1,2-DIBROMOETHANE	0.0	1.00	71-55-6	1,1,1-TRICHLOROETHANE	0.0	1.00
74-95-3	DIBROMOMETHANE	0.0	1.00	79-00-5	1,1,2-TRICHLOROETHANE	0.0	1.00
764-41-0	1,4-DICHLORO-2-BUTENE	0.0	5.00	79-01-6	TRICHLOROETHENE	0.0	1.00
75-71-8	DICHLORODIFLUOROMETHANE	0.0	5.00	75-69-4	TRICHLOROFLUOROMETHANE	0.0	5.00
75-34-3	1,1-DICHLOROETHANE	0.0	1.00	96-18-4	1,2,3-TRICHLOROPROPANE	0.0	1.00
107-06-2	1,2-DICHLOROETHANE	0.0	1.00	108-05-4	VINYL ACETATE	0.0	5.00
75-35-4	1,1-DICHLOROETHENE	0.0	1.00	75-01-4	VINYL CHLORIDE	0.0	1.00
				1330-20-7	TOTAL XYLENES	0.0	1.00

LYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION .
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 003-041291/ TP-5 TRAIN CNT #219
DATA FILE: >4B12A::D3
DATE REPORTED: 4/17/91 3:54
DILUTION FACT: 100.0000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
83-32-9	ACENAPHTHENE	BMDL	0.50
208-96-8	ACENAPHTHYLENE	BMDL	0.50
98-86-2	ACETOPHENONE	BMDL	0.50
309-00-2	ALDRIN	BMDL	0.50
101-05-3	ANILAZINE	BMDL	10.0
62-53-3	ANILINE	BMDL	0.75
120-12-7	ANTHRACENE	BMDL	1.00
12674-11-2	AROCHLOR-1016	BMDL	5.00
11104-28-2	AROCHLOR-1221	BMDL	5.00
11141-16-5	AROCHLOR-1232	BMDL	5.00
53469-21-9	AROCHLOR-1242	BMDL	5.00
12672-29-6	AROCHLOR-1248	BMDL	5.00
11097-69-1	AROCHLOR-1254	BMDL	5.00
11096-82-5	AROCHLOR-1260	BMDL	5.00
86-50-0	AZINPHOS METHYL "GUTHION"	BMDL	5.00
101-27-9	BARBAN	BMDL	5.00
2-87-5	BENZIDINE	BMDL	20.0
5-85-0	BENZOIC ACID	BMDL	25.0
56-55-3	BENZO(a)ANTHRACENE	BMDL	0.75
205-99-2	BENZO(b)FLUORANTHENE	BMDL	0.75
207-08-9	BENZO(k)FLUORANTHENE	BMDL	1.00
191-24-2	BENZO(ghi)PERYLENE	BMDL	0.85
50-32-8	BENZO(a)PYRENE	BMDL	1.00
106-51-4	p-BENZOQUINONE	BMDL	1.00
100-51-6	BENZYL ALCOHOL	BMDL	1.00
319-84-6	BHC-alpha	BMDL	1.00
319-85-7	BHC-beta	BMDL	1.00
319-86-8	BHC-delta	BMDL	1.00
58-89-9	BHC-gamma "LINDANE"	BMDL	1.00
111-91-1	BIS(2-CHLOROETHOXY)METHANE	BMDL	1.00
111-44-4	BIS(2-CHLOROETHYL)ETHER	BMDL	1.00
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	BMDL	1.00
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	BMDL	1.00
101-55-3	4-BROMODIPHENYLETHER	BMDL	0.50
1689-84-5	BROMOXYNIL	BMDL	5.00
85-68-7	BUTYLBENZYLPHTHALATE	BMDL	1.00
2425-06-1	CAPTAFOL	BMDL	5.00
133-06-2	CAPTAN	BMDL	2.50
63-25-2	CARBARYL	BMDL	1.00
1563-66-2	CARBOFURAN	BMDL	1.00
786-19-6	CARBOPHENOTHION	BMDL	1.50
57-74-9	CHLORDANE	BMDL	5.00
470-90-6	CHLORFEVINPHOS	BMDL	1.00
106-47-8	4-CHLOROANILINE	BMDL	2.50
510-15-6	CHLOROBENZILATE	BMDL	1.00
59-50-7	4-CHLORO-3-METHYLPHENOL	BMDL	10.0
91-58-7	2-CHLORONAPHTHALENE	BMDL	1.00
95-57-8	2-CHLOROPHENOL	BMDL	1.00
7005-72-3	4-CHLORODIPHENYLETHER	BMDL	1.00
8-01-9	CHRYSENE	BMDL	2.50
3-72-4	COUMAPHOS	BMDL	2.50
7700-17-6	CROTOXYPHOS	BMDL	5.00
72-54-8	p'p'-DDD	BMDL	1.00
72-55-9	p'p'-DDE	BMDL	1.00
50-29-3	p'p'-DDT	BMDL	5.00

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
298-03-3	DEMETON-o	BMDL	1.00
126-75-0	DEMETON-s	BMDL	1.00
2303-16-4	cis-DIALLATE	BMDL	1.00
2303-16-4	trans-DIALLATE	BMDL	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	BMDL	1.00
132-64-9	DIBENZOFURAN	BMDL	1.00
84-74-2	DI-n-BUTYLPHTHALATE	BMDL	1.00
117-80-6	DICHLONE	BMDL	5.00
95-50-1	1,2-DICHLOROBENZENE	BMDL	1.00
541-73-1	1,3-DICHLOROBENZENE	BMDL	1.00
106-46-7	1,4-DICHLOROBENZENE	BMDL	1.00
91-94-1	3,3-DICHLOROBENZIDINE	BMDL	20.0
120-83-2	2,4-DICHLOROPHENOL	BMDL	20.0
62-73-7	DICHLORVOS	BMDL	5.00
141-66-2	DICROTOPHOS	BMDL	5.00
60-57-1	DIELDRIN	BMDL	2.50
84-66-2	DIETHYLPHTHALATE	BMDL	1.00
60-51-5	DIMETHOATE	BMDL	2.50
105-67-9	2,4-DIMETHYLPHENOL	BMDL	2.00
131-11-3	DIMETHYLPHTHALATE	BMDL	1.00
528-29-0	m-DINITROBENZENE	BMDL	10.0
534-52-1	4,6-DINITRO-2-METHYLPHENOL	BMDL	40.0
51-28-5	2,4-DINITROPHENOL	BMDL	10.0
121-14-2	2,4-DINITROTOLUENE	BMDL	10.0
606-20-2	2,6-DINITROTOLUENE	BMDL	10.0
88-85-7	DINOSEB	BMDL	5.00
122-39-4	DIPHENYLAMINE	BMDL	2.50
122-66-7	1,2-DIPHENYLHYDRAZINE	BMDL	5.00
117-84-0	DI-n-OCTYLPHTHALATE	BMDL	5.00
298-04-4	DISULFOTON	BMDL	1.00
959-98-8	ENDOSULFAN I	BMDL	5.00
33212-65-9	ENDOSULFAN II	BMDL	5.00
1031-07-8	ENDOSULFAN SULFATE	BMDL	5.00
72-20-8	ENDRIN	BMDL	5.00
	ENDRIN KETONE	BMDL	1.00
2104-64-5	EPN	BMDL	1.00
563-12-2	ETHION	BMDL	1.00
52-85-7	FAMPHUR	BMDL	1.00
55-38-9	FENTHION	BMDL	1.00
33245-39-5	FLUCHLORALIN	BMDL	1.00
86-73-7	FLUORENE	BMDL	1.00
76-44-8	HEPATACHLOR	BMDL	1.00
1024-57-3	HEPTACHLOR EPOXIDE	BMDL	1.00
118-74-1	HEXACHLOROBENZENE	BMDL	1.00
87-68-3	HEXACHLOROBUTADIENE	BMDL	1.00
77-47-4	HEXACHLOROCYCLOPENTADIENE	BMDL	1.00
67-72-1	HEXACHLOROETHANE	BMDL	1.00
123-31-9	HYDROQUINONE	BMDL	1.00
193-39-5	INDENO(1,2,3-cd)PYRENE	BMDL	1.00
465-73-6	ISODRIN	BMDL	1.00
78-59-1	ISOPHORONE	BMDL	1.00
143-50-0	KEPONE	BMDL	1.00
21609-90-5	LEPTOPHOS	BMDL	1.00
121-75-5	MALATHION	BMDL	1.00

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 003-041291/ TP-5 TRAIN CNT #219
DATA FILE: >4B12A::D3

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
72-43-5	METHOXYCHLOR-p'p'	BMDL	5.00
90-12-0	1-METHYLNAPHTHALENE	BMDL	1.00
91-57-6	2-METHYLNAPHTHALENE	BMDL	1.00
298-00-0	METHYL PARATHION	BMDL	1.00
95-48-7	2-METHYLPHENOL "o-CRESOL"	BMDL	5.00
108-39-4	3-METHYLPHENOL "m-CRESOL"	BMDL	5.00
106-44-5	4-METHYLPHENOL "p-CRESOL"	BMDL	5.00
7786-34-7	MEVINPHOS	BMDL	1.00
2385-85-5	MIREX	BMDL	5.00
6923-22-4	MONOCROTOPHOS	BMDL	5.00
300-76-5	NALED	BMDL	5.00
91-20-3	NAPHTHALENE	390	1.00
130-15-4	1,4-NAPHTHOQUINONE	BMDL	5.00
54-11-5	NICOTINE	BMDL	10.0
98-95-3	NITROBENZENE	BMDL	5.00
1836-75-5	NITROFEN	BMDL	5.00
88-75-5	2-NITROPHENOL	BMDL	5.00
100-02-7	4-NITROPHENOL	BMDL	5.00
62-75-9	n-NITROSODIMETHYLAMINE	BMDL	10.0
86-30-6	n-NITROSODIPHENYLAMINE	BMDL	10.0
621-64-7	n-NITROSODI-n-PROPYLAMINE	BMDL	10.0
56-38-2	PARATHION	BMDL	1.00
82-68-3	PENTACHLORONITROBENZENE	BMDL	1.00
87-86-5	PENTACHLOROPHENOL	BMDL	5.00
85-01-8	PHENANTHRENE	BMDL	1.00
108-95-2	PHENOL	BMDL	1.00
298-02-2	PHORATE	BMDL	1.00
732-11-6	PHOSMET	BMDL	1.00
13171-21-6	PHOSPHAMIDON	BMDL	5.00
109-06-8	2-PICOLINE	BMDL	10.0
23950-58-5	PRONAMIDE	BMDL	1.00
129-00-0	PYRENE	BMDL	1.00
110-86-1	PYRIDINE	BMDL	10.0
13071-79-9	TERBUFOS	BMDL	5.00
95-94-3	1,2,4,5-TETRACHLOROBENZENE	BMDL	1.00
961-11-5	TETRACHLORVINPHOS	BMDL	5.00
8001-35-2	TOXAPHENE	BMDL	5.00
120-82-1	1,2,4-TRICHLOROBENZENE	BMDL	2.50
95-95-4	2,4,5-TRICHLOROPHENOL	BMDL	1.00
88-06-2	2,4,6-TRICHLOROPHENOL	BMDL	1.00
1582-09-8	TRIFLURALIN	BMDL	1.50

MISCELLANEOUS ANALYTES

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
30560-19-1	ACEPHATE	BMDL	10.0
76-06-2	CHLORPICRIN	BMDL	5.00
2675-77-6	CHLORNEB	BMDL	1.00
5598-13-0	CHLORPYRIFOS "DURSBAN"	BMDL	1.00
99-30-9	DICHLORAN "BOTRAN"	BMDL	1.00
333-41-5	DIAZINON	BMDL	1.00
120-36-5	DICHLORPROP	BMDL	10.0
957-51-7	DIPHENAMID	BMDL	1.00
25311-71-1	ISOFENPHOS	BMDL	5.00
150-50-5	MERPHOS	BMDL	1.00
114-26-1	PROPUXUR	BMDL	5.00
206-44-0	FLUORANTHENE	BMDL	1.00

BMDL = BELOW METHOD DETECTION LIMIT
ACTUAL METHOD DETECTION LIMIT = DILUTION FACTOR x MDL

KYLE A. JOHNSON - Chemist

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	TP-8/TRAIN. CNT.	EPA:	# FL095
SAMPLE NUMBER	004-041291	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/12/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/11/91	GEORGIA:	# 828
SAMPLE TYPE	SOIL	SOUTH CAROLINA:	# 96015
SUBMITTER	DIRECT EXPRESS		

TEST		RESULTS	
LEAD,T	3050/7421	3210.0	MG/KG D.W.
ARSENIC,T	3050/7060	2.10	MG/KG D.W.
BARIUM,T	3050/7080	41.	MG/KG D.W.
CADMIUM,T	3050/7131	3.10	MG/KG D.W.
CHROMIUM,T	3050/7191	49.0	MG/KG D.W.
SELENIUM,T	3050/7740	.30	MG/KG D.W.
MERCURY,T	7471	<0.1	MG/KG D.W.
SILVER,T	3050/7760	.3	MG/KG D.W.
EPA 8240		POSITIVE	
EPA 8270		POSITIVE	
pH OF SOLID	9045	7.4	

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE
SAMPLE: 004-041291/ TP-8 TRAIN. CNT. #219
DATA FILE: >41617::D4
DATE REPORTED: 4/17/91 4:25
DILUTION FACT: 5.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8240
PURGEABLE ORGANICS - SOILS -

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)	CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
67-64-1	ACETONE	0.0	5.00	95-50-1	o-DICHLOROBENZENE	23.3	1.00
75-05-8	ACETONITRILE	0.0	10.0	541-73-1	m-DICHLOROBENZENE	0.0	1.00
107-02-8	ACROLEIN	0.0	80.0	106-46-7	p-DICHLOROBENZENE	97.0	1.00
107-13-1	ACRYLONITRILE	0.0	20.0	156-60-5	trans,1,2-DICHLOROETHENE	0.0	1.00
71-43-2	BENZENE	0.0	1.00	78-87-5	1,2-DICHLOROPROPANE	0.0	1.00
100-44-7	BENZYL CHLORIDE	0.0	1.00	10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	1.00
75-27-4	BROMODICHLOROMETHANE	0.0	1.00	10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	1.00
75-25-2	BROMOFORM	0.0	1.00	100-41-4	ETHYLBENZENE	0.0	1.00
74-83-9	BROMOMETHANE	0.0	5.00	591-78-6	HEXANE	0.0	1.00
78-93-3	2-BUTANONE (MEK)	0.0	10.0	78-83-1	ISOBUTYL ALCOHOL	0.0	20.0
75-15-0	CARBON DISULFIDE	0.0	5.00	75-09-2	METHYLENE CHLORIDE	0.0	5.00
56-23-53	CARBON TETRACHLORIDE	0.0	1.00	108-10-1	4-METHYL-2-PENTANONE	0.0	10.0
108-90-7	CHLOROBENZENE	154.0	1.00	109-06-8	2-PICOLINE	0.0	
124-48-1	CHLORODIBROMOMETHANE	0.0	1.00	110-86-1	PYRIDINE	0.0	
75-00-3	CHLOROETHANE	0.0	5.00	100-42-5	STYRENE	0.0	1.00
110-75-8	2-CHLOROETHYLVINYLETHER	0.0	5.00	630-20-6	1,1,1,2-TETRACHLOROETHANE	0.0	1.00
67-66-3	CHLOROFORM	0.0	1.00	79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	1.00
74-87-3	CHLOROMETHANE	0.0	1.00	127-18-4	TETRACHLOROETHENE	0.0	1.00
96-12-8	1,2-DIBROMO-3-CHLOROPRO	0.0	1.00	108-88-3	TOLUENE	0.0	1.00
106-93-4	1,2-DIBROMOETHANE	0.0	1.00	71-55-6	1,1,1-TRICHLOROETHANE	0.0	1.00
74-95-3	DIBROMOMETHANE	0.0	1.00	79-00-5	1,1,2-TRICHLOROETHANE	0.0	1.00
764-41-0	1,4-DICHLORO-2-BUTENE	0.0	5.00	79-01-6	TRICHLOROETHENE	0.0	1.00
75-71-8	DICHLORODIFLUOROMETHANE	0.0	5.00	75-69-4	TRICHLOROFLUOROMETHANE	0.0	5.00
75-34-3	1,1-DICHLOROETHANE	0.0	1.00	96-18-4	1,2,3-TRICHLOROPROPANE	0.0	1.00
107-06-2	1,2-DICHLOROETHANE	0.0	1.00	108-05-4	VINYL ACETATE	0.0	5.00
75-35-4	1,1-DICHLOROETHENE	0.0	1.00	75-01-4	VINYL CHLORIDE	0.0	1.00
				1330-20-7	TOTAL XYLENES	0.0	1.00

KYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FA
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 004-041291/ TP-8 TRAIN CNT #219
DATA FILE: >4B13A::D3
DATE REPORTED: 4/17/91 5:12
DILUTION FACT: 100.0000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
83-32-9	ACENAPHTHENE	160	0.50
208-96-8	ACENAPHTHYLENE	165	0.50
98-86-2	ACETOPHENONE	BMDL	0.50
309-00-2	ALDRIN	BMDL	0.50
101-05-3	ANILAZINE	BMDL	10.0
62-53-3	ANILINE	BMDL	0.75
120-12-7	ANTHRACENE	380	1.00
12674-11-2	AROCHLOR-1016	BMDL	5.00
11104-28-2	AROCHLOR-1221	BMDL	5.00
11141-16-5	AROCHLOR-1232	BMDL	5.00
53469-21-9	AROCHLOR-1242	BMDL	5.00
12672-29-6	AROCHLOR-1248	BMDL	5.00
11097-69-1	AROCHLOR-1254	BMDL	5.00
11096-82-5	AROCHLOR-1260	BMDL	5.00
86-50-0	AZINPHOS METHYL "GUTHION"	BMDL	5.00
01-27-9	BARBAN	BMDL	5.00
2-87-5	BENZIDINE	BMDL	20.0
65-85-0	BENZOIC ACID	BMDL	25.0
56-55-3	BENZO(a)ANTHRACENE	260	0.75
205-99-2	BENZO(b)FLUORANTHENE	470	0.75
207-08-9	BENZO(k)FLUORANTHENE	470	1.00
191-24-2	BENZO(ghi)PERYLENE	BMDL	0.85
50-32-8	BENZO(a)PYRENE	240	1.00
106-51-4	p-BENZOQUINONE	BMDL	1.00
100-51-6	BENZYL ALCOHOL	BMDL	1.00
319-84-6	BHC-alpha	BMDL	1.00
319-85-7	BHC-beta	BMDL	1.00
319-86-8	BHC-delta	BMDL	1.00
58-89-9	BHC-gamma "LINDANE"	BMDL	1.00
111-91-1	BIS(2-CHLOROETHOXY)METHANE	BMDL	1.00
111-44-4	BIS(2-CHLOROETHYL)ETHER	BMDL	1.00
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	BMDL	1.00
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	8690	1.00
101-55-3	4-BROMODIPHENYLETHER	BMDL	0.50
1689-84-5	BROMOXYNIL	BMDL	5.00
85-68-7	BUTYLBENZYLPHTHALATE	3330	1.00
2425-06-1	CAPTAFOL	BMDL	5.00
133-06-2	CAPTAN	BMDL	2.50
63-25-2	CARBARYL	BMDL	1.00
1563-66-2	CARBOFURAN	BMDL	1.00
786-19-6	CARBOPHENOTHION	BMDL	1.50
57-74-9	CHLORDANE	BMDL	5.00
470-90-6	CHLORFEVINPHOS	BMDL	1.00
106-47-8	4-CHLOROANILINE	BMDL	2.50
510-15-6	CHLOROBENZILATE	BMDL	1.00
59-50-7	4-CHLORO-3-METHYLPHENOL	BMDL	10.0
91-58-7	2-CHLORONAPHTHALENE	BMDL	1.00
95-57-8	2-CHLOROPHENOL	BMDL	1.00
005-72-3	4-CHLORODIPHENYLETHER	BMDL	1.00
18-01-9	CHRYSENE	420	2.50
56-72-4	COUMAPHOS	BMDL	2.50
7700-17-6	CROTOXYPHOS	BMDL	5.00
72-54-8	p'p'-DDD	BMDL	1.00
72-55-9	p'p'-DDE	BMDL	1.00
50-29-3	p'p'-DDT	BMDL	5.00

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
298-03-3	DEMETON-o	BMDL	1.00
126-75-0	DEMETON-s	BMDL	1.00
2303-16-4	cis-DIALLATE	BMDL	1.00
2303-16-4	trans-DIALLATE	BMDL	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	BMDL	1.00
132-64-9	DIBENZOFURAN	BMDL	1.00
84-74-2	DI-n-BUTYLPHTHALATE	BMDL	1.00
117-80-6	DICHLONE	BMDL	5.00
95-50-1	1,2-DICHLOROBENZENE	BMDL	1.00
541-73-1	1,3-DICHLOROBENZENE	BMDL	1.00
106-46-7	1,4-DICHLOROBENZENE	100	1.00
91-94-1	3,3-DICHLOROBENZIDINE	BMDL	20.0
120-83-2	2,4-DICHLOROPHENOL	BMDL	20.0
62-73-7	DICHLORVOS	BMDL	5.00
141-66-2	DICROTOPHOS	BMDL	5.00
60-57-1	DIELDRIN	BMDL	2.50
84-66-2	DIETHYLPHTHALATE	BMDL	1.00
60-51-5	DIMETHOATE	BMDL	2.50
105-67-9	2,4-DIMETHYLPHENOL	BMDL	2.00
131-11-3	DIMETHYLPHTHALATE	BMDL	1.00
528-29-0	m-DINITROBENZENE	BMDL	10.0
534-52-1	4,6-DINITRO-2-METHYLPHENOL	BMDL	40.0
51-28-5	2,4-DINITROPHENOL	BMDL	10.0
121-14-2	2,4-DINITROTOLUENE	BMDL	10.0
606-20-2	2,6-DINITROTOLUENE	BMDL	10.0
88-85-7	DINOSEB	BMDL	5.00
122-39-4	DIPHENYLAMINE	BMDL	2.50
122-66-7	1,2-DIPHENYLHYDRAZINE	BMDL	5.00
117-84-0	DI-n-OCTYLPHTHALATE	BMDL	5.00
298-04-4	DISULFOTON	BMDL	1.00
959-98-8	ENDOSULFAN I	BMDL	5.00
33212-65-9	ENDOSULFAN II	BMDL	5.00
1031-07-8	ENDOSULFAN SULFATE	BMDL	5.00
72-20-8	ENDRIN	BMDL	5.00
	ENDRIN KETONE	BMDL	1.00
2104-64-5	EPN	BMDL	1.00
563-12-2	ETHION	BMDL	1.00
52-85-7	FAMPHUR	BMDL	1.00
55-38-9	FENTHION	BMDL	1.00
33245-39-5	FLUCHLORALIN	BMDL	1.00
86-73-7	FLUORENE	210	1.00
76-44-8	HEPATACHLOR	BMDL	1.00
1024-57-3	HEPTACHLOR EPOXIDE	BMDL	1.00
118-74-1	HEXACHLOROBENZENE	BMDL	1.00
87-68-3	HEXACHLOROBUTADIENE	BMDL	1.00
77-47-4	HEXACHLOROCYCLOPENTADIENE	BMDL	1.00
67-72-1	HEXACHLOROETHANE	BMDL	1.00
123-31-9	HYDROQUINONE	BMDL	1.00
193-39-5	INDENO(1,2,3-cd)PYRENE	BMDL	1.00
465-73-6	ISODRIN	BMDL	1.00
78-59-1	ISOPHORONE	BMDL	1.00
143-50-0	KEPONE	BMDL	1.00
21609-90-5	LEPTOPHOS	BMDL	1.00

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 004-041291/ TP-8 TRAIN CNT #219
DATA FILE: >4B13A::D3

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
72-43-5	METHOXYCHLOR-p'p'	BMDL	5.00
90-12-0	1-METHYLNAPHTHALENE	330	1.00
91-57-6	2-METHYLNAPHTHALENE	630	1.00
298-00-0	METHYL PARATHION	BMDL	1.00
95-48-7	2-METHYLPHENOL "o-CRESOL"	BMDL	5.00
108-39-4	3-METHYLPHENOL "m-CRESOL"	BMDL	5.00
106-44-5	4-METHYLPHENOL "p-CRESOL"	BMDL	5.00
7786-34-7	MEVINPHOS	BMDL	1.00
2385-85-5	MIREX	BMDL	5.00
6923-22-4	MONOCROTOPHOS	BMDL	5.00
300-76-5	NALED	BMDL	5.00
91-20-3	NAPHTHALENE	580	1.00
130-15-4	1,4-NAPHTHOQUINONE	BMDL	5.00
54-11-5	NICOTINE	BMDL	10.0
98-95-3	NITROBENZENE	BMDL	5.00
1836-75-5	NITROFEN	BMDL	5.00
88-75-5	2-NITROPHENOL	BMDL	5.00
100-02-7	4-NITROPHENOL	BMDL	5.00
62-75-9	n-NITROSODIMETHYLAMINE	BMDL	10.0
86-30-6	n-NITROSODIPHENYLAMINE	BMDL	10.0
621-64-7	n-NITROSODI-n-PROPYLAMINE	BMDL	10.0
56-38-2	PARATHION	BMDL	1.00
82-68-3	PENTACHLORONITROBENZENE	BMDL	1.00
87-86-5	PENTACHLOROPHENOL	BMDL	5.00
85-01-8	PHENANTHRENE	1800	1.00
108-95-2	PHENOL	BMDL	1.00
298-02-2	PHORATE	BMDL	1.00
732-11-6	PHOSMET	BMDL	1.00
13171-21-6	PHOSPHAMIDON	BMDL	5.00
109-06-8	2-PICOLINE	BMDL	10.0
23950-58-5	PRONAMIDE	BMDL	1.00
129-00-0	PYRENE	1290	1.00
110-86-1	PYRIDINE	BMDL	10.0
13071-79-9	TERBUFOS	BMDL	5.00
95-94-3	1,2,4,5-TETRACHLOROBENZENE	BMDL	1.00
961-11-5	TETRACHLORVINPHOS	BMDL	5.00
8001-35-2	TOXAPHENE	BMDL	5.00
120-82-1	1,2,4-TRICHLOROBENZENE	BMDL	2.50
95-95-4	2,4,5-TRICHLOROPHENOL	BMDL	1.00
88-06-2	2,4,6-TRICHLOROPHENOL	BMDL	1.00
1582-09-8	TRIFLURALIN	BMDL	1.50

MISCELLANEOUS ANALYTES

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg
30560-19-1	ACEPHATE	BMDL	10.0
76-06-2	CHLORPICRIN	BMDL	5.00
2675-77-6	CHLORNEB	BMDL	1.00
5598-13-0	CHLORPYRIFOS "DURSBAN"	BMDL	1.00
99-30-9	DICHLORAN "BOTRAN"	BMDL	1.00
333-41-5	DIAZINON	BMDL	1.00
120-36-5	DICHLORPROP	BMDL	10.0
957-51-7	DIPHENAMID	BMDL	1.00
25311-71-1	ISOFENPHOS	BMDL	5.00
150-50-5	MERPHOS	BMDL	1.00
114-26-1	PROPUXUR	BMDL	5.00
206-44-0	FLUORANTHENE	1920	1.00

BMDL = BELOW METHOD DETECTION LIMIT
ACTUAL METHOD DETECTION LIMIT = DILUTION FACTOR x MDL

LYCE A. JOHNSON, Chemist

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	TP-2A//TRAIN CNTR	EPA:	# FL095
SAMPLE NUMBER	005-041291	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/12/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/11/91	GEORGIA:	# 828
SAMPLE TYPE	SOIL	SOUTH CAROLINA:	# 96015
SUBMITTER	DIRECT EXPRESS		

TEST		RESULTS	
LEAD,T	3050/7421	22.0	MG/KG D.W.
ARSENIC,T	3050/7060	11.00	MG/KG D.W.
BARIUM,T	3050/7080	110.	MG/KG D.W.
CADMIUM,T	3050/7131	.30	MG/KG D.W.
CHROMIUM,T	3050/7191	15.0	MG/KG D.W.
SELENIUM,T	3050/7740	.40	MG/KG D.W.
MERCURY,T	7471	<0.1	MG/KG D.W.
SILVER,T	3050/7760	<0.1	MG/KG D.W.
EPA 8240		POSITIVE	
EPA 8270		POSITIVE	
pH OF SOLID	9045	7.5	

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE
SAMPLE: 005-041291/ TP-2A TRAIN. CNT. #21
DATA FILE: >41618::D4
DATE REPORTED: 4/17/91 5:27
DILUTION FACT: 5.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8240
PURGEABLE ORGANICS - SOILS -

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)	CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
67-64-1	ACETONE	0.0	5.00	95-50-1	o-DICHLOROBENZENE	0.0	1.00
75-05-8	ACETONITRILE	0.0	10.0	541-73-1	m-DICHLOROBENZENE	0.0	1.00
107-02-8	ACROLEIN	0.0	80.0	106-46-7	p-DICHLOROBENZENE	0.0	1.00
107-13-1	ACRYLONITRILE	0.0	20.0	156-60-5	trans,1,2-DICHLOROETHENE	0.0	1.00
71-43-2	BENZENE	0.0	1.00	78-87-5	1,2-DICHLOROPROPANE	0.0	1.00
100-44-7	BENZYL CHLORIDE	0.0	1.00	10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	1.00
75-27-4	BROMODICHLOROMETHANE	0.0	1.00	10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	1.00
75-25-2	BROMOFORM	0.0	1.00	100-41-4	ETHYLBENZENE	0.0	1.00
74-83-9	BROMOMETHANE	0.0	5.00	591-78-6	HEXANE	0.0	1.00
78-93-3	2-BUTANONE (MEK)	0.0	10.0	78-83-1	ISOBUTYL ALCOHOL	0.0	20.0
75-15-0	CARBON DISULFIDE	0.0	5.00	75-09-2	METHYLENE CHLORIDE	0.0	5.00
56-23-53	CARBON TETRACHLORIDE	0.0	1.00	108-10-1	4-METHYL-2-PENTANONE	0.0	10.0
108-90-7	CHLOROBENZENE	0.0	1.00	109-06-8	2-PICOLINE	0.0	
124-48-1	CHLORODIBROMOMETHANE	0.0	1.00	110-86-1	PYRIDINE	0.0	
75-00-3	CHLOROETHANE	0.0	5.00	100-42-5	STYRENE	0.0	1.00
110-75-8	2-CHLOROETHYLVINYLETHER	0.0	5.00	630-20-6	1,1,1,2-TETRACHLOROETHANE	0.0	1.00
67-66-3	CHLOROFORM	0.0	1.00	79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	1.00
74-87-3	CHLOROMETHANE	0.0	1.00	127-18-4	TETRACHLOROETHENE	0.0	1.00
96-12-8	1,2-DIBROMO-3-CHLOROPRO	0.0	1.00	108-88-3	TOLUENE	0.0	1.00
106-93-4	1,2-DIBROMOETHANE	0.0	1.00	71-55-6	1,1,1-TRICHLOROETHANE	0.0	1.00
74-95-3	DIBROMOMETHANE	0.0	1.00	79-00-5	1,1,2-TRICHLOROETHANE	0.0	1.00
764-41-0	1,4-DICHLORO-2-BUTENE	0.0	5.00	79-01-6	TRICHLOROETHENE	0.0	1.00
75-71-8	DICHLORODIFLUOROMETHANE	0.0	5.00	75-69-4	TRICHLOROFLUOROMETHANE	0.0	5.00
75-34-3	1,1-DICHLOROETHANE	0.0	1.00	96-18-4	1,2,3-TRICHLOROPROPANE	0.0	1.00
107-06-2	1,2-DICHLOROETHANE	0.0	1.00	108-05-4	VINYL ACETATE	0.0	5.00
75-35-4	1,1-DICHLOROETHENE	0.0	1.00	75-01-4	VINYL CHLORIDE	0.0	1.00
				1330-20-7	TOTAL XYLENES	6.3	1.00

LYLE A. JOHNSON / Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FAC
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 005-041291/ TP-2A TRAIN CNT #219
DATA FILE: >4B14A::D3
DATE REPORTED: 4/17/91 6:35
DILUTION FACT: 100.0000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
83-32-9	ACENAPHTHENE	BMDL	0.50
208-96-8	ACENAPHTHYLENE	BMDL	0.50
98-86-2	ACETOPHENONE	BMDL	0.50
309-00-2	ALDRIN	BMDL	0.50
101-05-3	ANILAZINE	BMDL	10.0
62-53-3	ANILINE	BMDL	0.75
120-12-7	ANTHRACENE	100	1.00
12674-11-2	AROCHLOR-1016	BMDL	5.00
11104-28-2	AROCHLOR-1221	BMDL	5.00
11141-16-5	AROCHLOR-1232	BMDL	5.00
53469-21-9	AROCHLOR-1242	BMDL	5.00
12672-29-6	AROCHLOR-1248	BMDL	5.00
11097-69-1	AROCHLOR-1254	BMDL	5.00
11096-82-5	AROCHLOR-1260	BMDL	5.00
86-50-0	AZINPHOS METHYL "GUTHION"	BMDL	5.00
91-27-9	BARBAN	BMDL	5.00
2-87-5	BENZIDINE	BMDL	20.0
65-85-0	BENZOIC ACID	BMDL	25.0
56-55-3	BENZO(a)ANTHRACENE	230	0.75
205-99-2	BENZO(b)FLUORANTHENE	BMDL	0.75
207-08-9	BENZO(k)FLUORANTHENE	BMDL	1.00
191-24-2	BENZO(ghi)PERYLENE	BMDL	0.85
50-32-8	BENZO(a)PYRENE	BMDL	1.00
106-51-4	p-BENZOQUINONE	BMDL	1.00
100-51-6	BENZYL ALCOHOL	BMDL	1.00
319-84-6	BHC-alpha	BMDL	1.00
319-85-7	BHC-beta	BMDL	1.00
319-86-8	BHC-delta	BMDL	1.00
58-89-9	BHC-gamma "LINDANE"	BMDL	1.00
111-91-1	BIS(2-CHLOROETHOXY)METHANE	BMDL	1.00
111-44-4	BIS(2-CHLOROETHYL)ETHER	BMDL	1.00
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	BMDL	1.00
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	630	1.00
101-55-3	4-BROMODIPHENYLETHER	BMDL	0.50
1689-84-5	BROMOXYNIL	BMDL	5.00
85-68-7	BUTYLBENZYLPHTHALATE	5130	1.00
2425-06-1	CAPTAFOL	BMDL	5.00
133-06-2	CAPTAN	BMDL	2.50
63-25-2	CARBARYL	BMDL	1.00
1563-66-2	CARBOFURAN	BMDL	1.00
786-19-6	CARBOPHENOTHION	BMDL	1.50
57-74-9	CHLORDANE	BMDL	5.00
470-90-6	CHLORFEVINPHOS	BMDL	1.00
106-47-8	4-CHLOROANILINE	BMDL	2.50
510-15-6	CHLOROBENZILATE	BMDL	1.00
59-50-7	4-CHLORO-3-METHYLPHENOL	BMDL	10.0
91-58-7	2-CHLORONAPHTHALENE	BMDL	1.00
95-57-8	2-CHLOROPHENOL	BMDL	1.00
005-72-3	4-CHLORODIPHENYLETHER	BMDL	1.00
218-01-9	CHRYSENE	120	2.50
56-72-4	COUMAPHOS	BMDL	2.50
7700-17-6	CROTOXYPHOS	BMDL	5.00
72-54-8	p'p'-DDD	BMDL	1.00
72-55-9	p'p'-DDE	BMDL	1.00
50-29-3	p'p'-DDT	BMDL	5.00

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
298-03-3	DEMETON-o	BMDL	1.00
126-75-0	DEMETON-s	BMDL	1.00
2303-16-4	cis-DIALLATE	BMDL	1.00
2303-16-4	trans-DIALLATE	BMDL	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	BMDL	1.00
132-64-9	DIBENZOFURAN	BMDL	1.00
84-74-2	DI-n-BUTYLPHTHALATE	BMDL	1.00
117-80-6	DICHLONE	BMDL	5.00
95-50-1	1,2-DICHLOROBENZENE	BMDL	1.00
541-73-1	1,3-DICHLOROBENZENE	BMDL	1.00
106-46-7	1,4-DICHLOROBENZENE	BMDL	1.00
91-94-1	3,3-DICHLOROBENZIDINE	BMDL	20.0
120-83-2	2,4-DICHLOROPHENOL	BMDL	20.0
62-73-7	DICHLORVOS	BMDL	5.00
141-66-2	DICROTOPHOS	BMDL	5.00
60-57-1	DIELDRIN	BMDL	2.50
84-66-2	DIETHYLPHTHALATE	BMDL	1.00
60-51-5	DIMETHOATE	BMDL	2.50
105-67-9	2,4-DIMETHYLPHENOL	BMDL	2.00
131-11-3	DIMETHYLPHTHALATE	BMDL	1.00
528-29-0	m-DINITROBENZENE	BMDL	10.0
534-52-1	4,6-DINITRO-2-METHYLPHENOL	BMDL	40.0
51-28-5	2,4-DINITROPHENOL	BMDL	10.0
121-14-2	2,4-DINITROTOLUENE	BMDL	10.0
606-20-2	2,6-DINITROTOLUENE	BMDL	10.0
88-85-7	DINOSEB	BMDL	5.00
122-39-4	DIPHENYLAMINE	BMDL	2.50
122-66-7	1,2-DIPHENYLHYDRAZINE	BMDL	5.00
117-84-0	DI-n-OCTYLPHTHALATE	BMDL	5.00
298-04-4	DISULFOTON	BMDL	1.00
959-98-8	ENDOSULFAN I	BMDL	5.00
33212-65-9	ENDOSULFAN II	BMDL	5.00
1031-07-8	ENDOSULFAN SULFATE	BMDL	5.00
72-20-8	ENDRIN	BMDL	5.00
	ENDRIN KETONE	BMDL	1.00
2104-64-5	EPN	BMDL	1.00
563-12-2	ETHION	BMDL	1.00
52-85-7	FAMPHUR	BMDL	1.00
55-38-9	FENTHION	BMDL	1.00
33245-39-5	FLUCHLORALIN	BMDL	1.00
86-73-7	FLUORENE	BMDL	1.00
76-44-8	HEPATACHLOR	BMDL	1.00
1024-57-3	HEPTACHLOR EPOXIDE	BMDL	1.00
118-74-1	HEXACHLOROBENZENE	BMDL	1.00
87-68-3	HEXACHLOROBUTADIENE	BMDL	1.00
77-47-4	HEXACHLOROCYCLOPENTADIENE	BMDL	1.00
67-72-1	HEXACHLOROETHANE	BMDL	1.00
123-31-9	HYDROQUINONE	BMDL	1.00
193-39-5	INDENO(1,2,3-cd)PYRENE	BMDL	1.00
465-73-6	ISODRIN	BMDL	1.00
78-59-1	ISOPHORONE	BMDL	1.00
143-50-0	KEPONE	BMDL	1.00
21609-90-5	LEPTOPHOS	BMDL	1.00

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 005-041291/ TP-2A TRAIN CNT #219
DATA FILE: >4B14A::D3

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
72-43-5	METHOXYCHLOR-p'p'	BMDL	5.00
90-12-0	1-METHYLNAPHTHALENE	BMDL	1.00
91-57-6	2-METHYLNAPHTHALENE	BMDL	1.00
298-00-0	METHYL PARATHION	BMDL	1.00
95-48-7	2-METHYLPHENOL "o-CRESOL"	BMDL	5.00
108-39-4	3-METHYLPHENOL "m-CRESOL"	BMDL	5.00
106-44-5	4-METHYLPHENOL "p-CRESOL"	BMDL	5.00
7786-34-7	MEVINPHOS	BMDL	1.00
2385-85-5	MIREX	BMDL	5.00
6923-22-4	MONOCROTOPHOS	BMDL	5.00
300-76-5	NALED	BMDL	5.00
91-20-3	NAPHTHALENE	560	1.00
130-15-4	1,4-NAPHTHOQUINONE	BMDL	5.00
54-11-5	NICOTINE	BMDL	10.0
98-95-3	NITROBENZENE	BMDL	5.00
1836-75-5	NITROFEN	BMDL	5.00
88-75-5	2-NITROPHENOL	BMDL	5.00
100-02-7	4-NITROPHENOL	BMDL	5.00
62-75-9	n-NITROSODIMETHYLAMINE	BMDL	10.0
86-30-6	n-NITROSODIPHENYLAMINE	BMDL	10.0
621-64-7	n-NITROSODI-n-PROPYLAMINE	BMDL	10.0
56-38-2	PARATHION	BMDL	1.00
82-68-3	PENTACHLORONITROBENZENE	BMDL	1.00
87-86-5	PENTACHLOROPHENOL	BMDL	5.00
85-01-8	PHENANTHRENE	180	1.00
108-95-2	PHENOL	BMDL	1.00
298-02-2	PHORATE	BMDL	1.00
732-11-6	PHOSMET	BMDL	1.00
13171-21-6	PHOSPHAMIDON	BMDL	5.00
109-06-8	2-PICOLINE	BMDL	10.0
23950-58-5	PRONAMIDE	BMDL	1.00
129-00-0	PYRENE	430	1.00
110-86-1	PYRIDINE	BMDL	10.0
13071-79-9	TERBUFOS	BMDL	5.00
95-94-3	1,2,4,5-TETRACHLOROBENZENE	BMDL	1.00
961-11-5	TETRACHLORVINPHOS	BMDL	5.00
8001-35-2	TOXAPHENE	BMDL	5.00
120-82-1	1,2,4-TRICHLOROBENZENE	BMDL	2.50
95-95-4	2,4,5-TRICHLOROPHENOL	BMDL	1.00
88-06-2	2,4,6-TRICHLOROPHENOL	BMDL	1.00
1582-09-8	TRIFLURALIN	BMDL	1.50

MISCELLANEOUS ANALYTES

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
30560-19-1	ACEPHATE	BMDL	10.0
76-06-2	CHLORPICRIN	BMDL	5.00
2675-77-6	CHLORNEB	BMDL	1.00
5598-13-0	CHLORPYRIFOS "DURSBAN"	BMDL	1.00
99-30-9	DICHLORAN "BOTRAN"	BMDL	1.00
333-41-5	DIAZINON	BMDL	1.00
120-36-5	DICHLORPROP	BMDL	10.0
957-51-7	DIPHENAMID	BMDL	1.00
25311-71-1	ISOFENPHOS	BMDL	5.00
150-50-5	MERPHOS	BMDL	1.00
114-26-1	PROPUXUR	BMDL	5.00
206-44-0	FLUORANTHENE	550	1.00

BMDL = BELOW METHOD DETECTION LIMIT
ACTUAL METHOD DETECTION LIMIT = DILUTION FACTOR x MDL

LYLE A. JOHNSON - Chemist

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	TP-5A//TRAIN CNTR	EPA:	# FL095
SAMPLE NUMBER	006-041291	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/12/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/11/91	GEORGIA:	# 828
SAMPLE TYPE	SOIL	SOUTH CAROLINA:	# 96015
SUBMITTER	DIRECT EXPRESS		

TEST		RESULTS	
LEAD,T	3050/7421	10.0	MG/KG D.W.
ARSENIC,T	3050/7060	.60	MG/KG D.W.
BARIUM,T	3050/7080	37.	MG/KG D.W.
CADMIUM,T	3050/7131	<0.1	MG/KG D.W.
CHROMIUM,T	3050/7191	4.8	MG/KG D.W.
SELENIUM,T	3050/7740	.20	MG/KG D.W.
MERCURY,T	7471	<0.1	MG/KG D.W.
SILVER,T	3050/7760	<0.1	MG/KG D.W.
EPA 8240		NEGATIVE	
EPA 8270		POSITIVE	
pH OF SOLID	9045	7.6	

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE
SAMPLE: 006-041291/ TP-5A TRAIN. CNT. #21
DATA FILE: >41619::D4
DATE REPORTED: 4/17/91 6:22
DILUTION FACT: 5.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8240
PURGEABLE ORGANICS - SOILS -

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)	CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
67-64-1	ACETONE	0.0	5.00	95-50-1	o-DICHLOROBENZENE	0.0	1.00
75-05-8	ACETONITRILE	0.0	10.0	541-73-1	m-DICHLOROBENZENE	0.0	1.00
107-02-8	ACROLEIN	0.0	80.0	106-46-7	p-DICHLOROBENZENE	0.0	1.00
107-13-1	ACRYLONITRILE	0.0	20.0	156-60-5	trans,1,2-DICHLOROETHENE	0.0	1.00
71-43-2	BENZENE	0.0	1.00	78-87-5	1,2-DICHLOROPROPANE	0.0	1.00
100-44-7	BENZYL CHLORIDE	0.0	1.00	10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	1.00
75-27-4	BROMODICHLOROMETHANE	0.0	1.00	10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	1.00
75-25-2	BROMOFORM	0.0	1.00	100-41-4	ETHYLBENZENE	0.0	1.00
74-83-9	BROMOMETHANE	0.0	5.00	591-78-6	HEXANE	0.0	1.00
78-93-3	2-BUTANONE (MEK)	0.0	10.0	78-83-1	ISOBUTYL ALCOHOL	0.0	20.0
75-15-0	CARBON DISULFIDE	0.0	5.00	75-09-2	METHYLENE CHLORIDE	0.0	5.00
56-23-53	CARBON TETRACHLORIDE	0.0	1.00	108-10-1	4-METHYL-2-PENTANONE	0.0	10.0
108-90-7	CHLOROBENZENE	0.0	1.00	109-06-8	2-PICOLINE	0.0	
124-48-1	CHLORODIBROMOMETHANE	0.0	1.00	110-86-1	PYRIDINE	0.0	
75-00-3	CHLOROETHANE	0.0	5.00	100-42-5	STYRENE	0.0	1.00
110-75-8	2-CHLOROETHYLVINYLETHER	0.0	5.00	630-20-6	1,1,1,2-TETRACHLOROETHANE	0.0	1.00
67-66-3	CHLOROFORM	0.0	1.00	79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	1.00
74-87-3	CHLOROMETHANE	0.0	1.00	127-18-4	TETRACHLOROETHENE	0.0	1.00
96-12-8	1,2-DIBROMO-3-CHLOROPRO	0.0	1.00	108-88-3	TOLUENE	0.0	1.00
106-93-4	1,2-DIBROMOETHANE	0.0	1.00	71-55-6	1,1,1-TRICHLOROETHANE	0.0	1.00
74-95-3	DIBROMOMETHANE	0.0	1.00	79-00-5	1,1,2-TRICHLOROETHANE	0.0	1.00
764-41-0	1,4-DICHLORO-2-BUTENE	0.0	5.00	79-01-6	TRICHLOROETHENE	0.0	1.00
75-71-8	DICHLORODIFLUOROMETHANE	0.0	5.00	75-69-4	TRICHLOROFLUOROMETHANE	0.0	5.00
75-34-3	1,1-DICHLOROETHANE	0.0	1.00	96-18-4	1,2,3-TRICHLOROPROPANE	0.0	1.00
107-06-2	1,2-DICHLOROETHANE	0.0	1.00	108-05-4	VINYL ACETATE	0.0	5.00
75-35-4	1,1-DICHLOROETHENE	0.0	1.00	75-01-4	VINYL CHLORIDE	0.0	1.00
				1330-20-7	TOTAL XYLENES	0.0	1.00

LYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACT
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 006-041291/ TP-5A TRAIN CNT #219
DATA FILE: >4B15A::D3
DATE REPORTED: 4/17/91 7:52
DILUTION FACT: 100.0000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
83-32-9	ACENAPHTHENE	BMDL	0.50
208-96-8	ACENAPHTHYLENE	BMDL	0.50
98-86-2	ACETOPHENONE	BMDL	0.50
309-00-2	ALDRIN	BMDL	0.50
101-05-3	ANILAZINE	BMDL	10.0
62-53-3	ANILINE	BMDL	0.75
120-12-7	ANTHRACENE	BMDL	1.00
12674-11-2	AROCHLOR-1016	BMDL	5.00
11104-28-2	AROCHLOR-1221	BMDL	5.00
11141-16-5	AROCHLOR-1232	BMDL	5.00
53469-21-9	AROCHLOR-1242	BMDL	5.00
12672-29-6	AROCHLOR-1248	BMDL	5.00
11097-69-1	AROCHLOR-1254	BMDL	5.00
11096-82-5	AROCHLOR-1260	BMDL	5.00
86-50-0	AZINPHOS METHYL "GUTHION"	BMDL	5.00
'01-27-9	BARBAN	BMDL	5.00
2-87-5	BENZIDINE	BMDL	20.0
65-85-0	BENZOIC ACID	BMDL	25.0
56-55-3	BENZO(a)ANTHRACENE	BMDL	0.75
205-99-2	BENZO(b)FLUORANTHENE	BMDL	0.75
207-08-9	BENZO(k)FLUORANTHENE	BMDL	1.00
191-24-2	BENZO(ghi)PERYLENE	BMDL	0.85
50-32-8	BENZO(a)PYRENE	BMDL	1.00
106-51-4	p-BENZOQUINONE	BMDL	1.00
100-51-6	BENZYL ALCOHOL	BMDL	1.00
319-84-6	BHC-alpha	BMDL	1.00
319-85-7	BHC-beta	BMDL	1.00
319-86-8	BHC-delta	BMDL	1.00
58-89-9	BHC-gamma "LINDANE"	BMDL	1.00
111-91-1	BIS(2-CHLOROETHOXY)METHANE	BMDL	1.00
111-44-4	BIS(2-CHLOROETHYL)ETHER	BMDL	1.00
39638-32-9	BIS(2-CHLOROISOPROPYL)ETHER	BMDL	1.00
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	BMDL	1.00
101-55-3	4-BROMODIPHENYLETHER	BMDL	0.50
1689-84-5	BROMOXYNIL	BMDL	5.00
85-68-7	BUTYLBENZYLPHTHALATE	2130	1.00
2425-06-1	CAPTAFOL	BMDL	5.00
133-06-2	CAPTAN	BMDL	2.50
63-25-2	CARBARYL	BMDL	1.00
1563-66-2	CARBOFURAN	BMDL	1.00
786-19-6	CARBOPHENOTHION	BMDL	1.50
57-74-9	CHLORDANE	BMDL	5.00
470-90-6	CHLORFEVINPHOS	BMDL	1.00
106-47-8	4-CHLOROANILINE	BMDL	2.50
510-15-6	CHLOROBENZILATE	BMDL	1.00
59-50-7	4-CHLORO-3-METHYLPHENOL	BMDL	10.0
91-58-7	2-CHLORONAPHTHALENE	BMDL	1.00
95-57-8	2-CHLOROPHENOL	BMDL	1.00
7005-72-3	4-CHLORODIPHENYLETHER	BMDL	1.00
18-01-9	CHRYSENE	BMDL	2.50
56-72-4	COUMAPHOS	BMDL	2.50
7700-17-6	CROTOXYPHOS	BMDL	5.00
72-54-8	p'p'-DDD	BMDL	1.00
72-55-9	p'p'-DDE	BMDL	1.00
50-29-3	p'p'-DDT	BMDL	5.00

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
298-03-3	DEMETON-o	BMDL	1.00
126-75-0	DEMETON-s	BMDL	1.00
2303-16-4	cis-DIALLATE	BMDL	1.00
2303-16-4	trans-DIALLATE	BMDL	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	BMDL	1.00
132-64-9	DIBENZOFURAN	BMDL	1.00
84-74-2	DI-n-BUTYLPHTHALATE	BMDL	1.00
117-80-6	DICHLONE	BMDL	5.00
95-50-1	1,2-DICHLOROBENZENE	BMDL	1.00
541-73-1	1,3-DICHLOROBENZENE	BMDL	1.00
106-46-7	1,4-DICHLOROBENZENE	BMDL	1.00
91-94-1	3,3-DICHLOROBENZIDINE	BMDL	20.0
120-83-2	2,4-DICHLOROPHENOL	BMDL	20.0
62-73-7	DICHLORVOS	BMDL	5.00
141-66-2	DICROTOPHOS	BMDL	5.00
60-57-1	DIELDRIN	BMDL	2.50
84-66-2	DIETHYLPHTHALATE	BMDL	1.00
60-51-5	DIMETHOATE	BMDL	2.50
105-67-9	2,4-DIMETHYLPHENOL	BMDL	2.00
131-11-3	DIMETHYLPHTHALATE	BMDL	1.00
528-29-0	m-DINITROBENZENE	BMDL	10.0
534-52-1	4,6-DINITRO-2-METHYLPHENOL	BMDL	40.0
51-28-5	2,4-DINITROPHENOL	BMDL	10.0
121-14-2	2,4-DINITROTOLUENE	BMDL	10.0
606-20-2	2,6-DINITROTOLUENE	BMDL	10.0
88-85-7	DINOSEB	BMDL	5.00
122-39-4	DIPHENYLAMINE	BMDL	2.50
122-66-7	1,2-DIPHENYLHYDRAZINE	BMDL	5.00
117-84-0	DI-n-OCTYLPHTHALATE	BMDL	5.00
298-04-4	DISULFOTON	BMDL	1.00
959-98-8	ENDOSULFAN I	BMDL	5.00
33212-65-9	ENDOSULFAN II	BMDL	5.00
1031-07-8	ENDOSULFAN SULFATE	BMDL	5.00
72-20-8	ENDRIN	BMDL	5.00
	ENDRIN KETONE	BMDL	1.00
2104-64-5	EPN	BMDL	1.00
563-12-2	ETHION	BMDL	1.00
52-85-7	FAMPHUR	BMDL	1.00
55-38-9	FENTHION	BMDL	1.00
33245-39-5	FLUCHLORALIN	BMDL	1.00
86-73-7	FLUORENE	BMDL	1.00
76-44-8	HEPATACHLOR	BMDL	1.00
1024-57-3	HEPTACHLOR EPOXIDE	BMDL	1.00
118-74-1	HEXACHLOROBENZENE	BMDL	1.00
87-68-3	HEXACHLOROBUTADIENE	BMDL	1.00
77-47-4	HEXACHLOROCYCLOPENTADIENE	BMDL	1.00
67-72-1	HEXACHLOROETHANE	BMDL	1.00
123-31-9	HYDROQUINONE	BMDL	1.00
193-39-5	INDENO(1,2,3-cd)PYRENE	BMDL	1.00
465-73-6	ISODRIN	BMDL	1.00
78-59-1	ISOPHORONE	BMDL	1.00
143-50-0	KEPONE	BMDL	1.00
21609-90-5	LEPTOPHOS	BMDL	1.00

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 006-041291/ TP-5A TRAIN CNT #219
DATA FILE: >4B15A::D3

EPA METHOD 8270
BASE/NEUTRALS AND ACIDS

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
72-43-5	METHOXYCHLOR-p'p'	BMDL	5.00
90-12-0	1-METHYLNAPHTHALENE	380	1.00
91-57-6	2-METHYLNAPHTHALENE	560	1.00
298-00-0	METHYL PARATHION	BMDL	1.00
95-48-7	2-METHYLPHENOL "o-CRESOL"	BMDL	5.00
108-39-4	3-METHYLPHENOL "m-CRESOL"	BMDL	5.00
106-44-5	4-METHYLPHENOL "p-CRESOL"	BMDL	5.00
7786-34-7	MEVINPHOS	BMDL	1.00
2385-85-5	MIREX	BMDL	5.00
6923-22-4	MONOCROTOPHOS	BMDL	5.00
300-76-5	NALED	BMDL	5.00
91-20-3	NAPHTHALENE	720	1.00
130-15-4	1,4-NAPHTHOQUINONE	BMDL	5.00
54-11-5	NICOTINE	BMDL	10.0
98-95-3	NITROBENZENE	BMDL	5.00
1836-75-5	NITROFEN	BMDL	5.00
88-75-5	2-NITROPHENOL	BMDL	5.00
100-02-7	4-NITROPHENOL	BMDL	5.00
62-75-9	n-NITROSODIMETHYLAMINE	BMDL	10.0
86-30-6	n-NITROSODIPHENYLAMINE	BMDL	10.0
621-64-7	n-NITROSODI-n-PROPYLAMINE	BMDL	10.0
56-38-2	PARATHION	BMDL	1.00
82-68-3	PENTACHLORONITROBENZENE	BMDL	1.00
87-86-5	PENTACHLOROPHENOL	BMDL	5.00
85-01-8	PHENANTHRENE	BMDL	1.00
108-95-2	PHENOL	BMDL	1.00
298-02-2	PHORATE	BMDL	1.00
732-11-6	PHOSMET	BMDL	1.00
13171-21-6	PHOSPHAMIDON	BMDL	5.00
109-06-8	2-PICOLINE	BMDL	10.0
23950-58-5	PRONAMIDE	BMDL	1.00
129-00-0	PYRENE	BMDL	1.00
110-86-1	PYRIDINE	BMDL	10.0
13071-79-9	TERBUFOS	BMDL	5.00
95-94-3	1,2,4,5-TETRACHLOROBENZENE	BMDL	1.00
961-11-5	TETRACHLORVINPHOS	BMDL	5.00
8001-35-2	TOXAPHENE	BMDL	5.00
120-82-1	1,2,4-TRICHLOROBENZENE	BMDL	2.50
95-95-4	2,4,5-TRICHLOROPHENOL	BMDL	1.00
88-06-2	2,4,6-TRICHLOROPHENOL	BMDL	1.00
1582-09-8	TRIFLURALIN	BMDL	1.50

MISCELLANEOUS ANALYTES

CAS No.	PARAMETER	CONCENTRATION (ug/kg)	*MDL (ug/kg)
[illegible]-1	ACEPHATE	BMDL	10.0
76-06-2	CHLORPICRIN	BMDL	5.00
2675-77-6	CHLORNEB	BMDL	1.00
5598-13-0	CHLORPYRIFOS "DURSBAN"	BMDL	1.00
99-30-9	DICHLORAN "BOTRAN"	BMDL	1.00
333-41-5	DIAZINON	BMDL	1.00
120-36-5	DICHLORPROP	BMDL	10.0
957-51-7	DIPHENAMID	BMDL	1.00
25311-71-1	ISOFENPHOS	BMDL	5.00
150-50-5	MERPHOS	BMDL	1.00
114-26-1	PROPUXUR	BMDL	5.00
206-44-0	FLUORANTHENE	BMDL	1.00

BMDL = BELOW METHOD DETECTION LIMIT
ACTUAL METHOD DETECTION LIMIT = DILUTION FACTOR x MDL

KYLE A. JOHNSON - Chemist

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	CSY-FMW #2/NAVAL	EPA:	# FL095
SAMPLE NUMBER	001-041591	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/15/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/12/91	GEORGIA:	# 828
SAMPLE TYPE	WATER	SOUTH CAROLINA:	# 96015
SUBMITTER	FEDEX		

TEST		RESULTS	
EPA 624		POSITIVE	
EPA 625		POSITIVE	
ARSENIC	SM 304	<0.002	MG/L
CADMIUM	SM 300 SERIES	<0.001	MG/L
CHROMIUM,T	SM 300 SERIES	<0.002	MG/L
COPPER	SM 300 SERIES	.030	MG/L
LEAD, T	SM 300 SERIES	.002	MG/L
MERCURY	SM 300 SERIES	<0.0002	MG/L
SELENIUM	SM 300 SERIES	.002	MG/L
SILVER	SM 300 SERIES	<0.002	MG/L
ZINC	SM 300 SERIES	.07	MG/L
ANTIMONY	SM 300 SERIES	.004	MG/L
BERYLLIUM	SM 300 SERIES	<0.002	MG/L
NICKEL	SM 300 SERIES	.06	MG/L
THALLIUM	SM 304	<0.002	MG/L

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

CLIENT: WESTINGHOUSE-ENVIRO.
SAMPLE: 001-041591/ CSY-FMW #2 NAVAL BASE
DATA FILE: >41505::D4
DATE ANALYZED: 4/15/91 20:08
DILUTION FACTOR: .20000

EPA METHOD 624 - PURGEABLE ORGANICS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
71-43-2	BENZENE	20.0	(0.20)
75-27-4	BROMODICHLOROMETHANE	0.0	(0.20)
75-25-2	BROMOFORM	0.0	(0.20)
74-83-9	BROMOMETHANE	0.0	(0.50)
56-23-5	CARBON TETRACHLORIDE	0.0	(0.50)
108-90-7	CHLOROBENZENE	13.6	(0.20)
75-00-3	CHLOROETHANE	0.0	(0.50)
67-66-3	CHLOROFORM	0.0	(0.20)
74-87-3	CHLOROMETHANE	0.0	(0.50
124-48-1	DIBROMOCHLOROMETHANE	0.0	(0.20
95-50-1	o-DICHLOROBENZENE	.3	(0.20)
541-73-1	m-DICHLOROBENZENE	0.0	(0.20)
106-46-7	p-DICHLOROBENZENE	7.5	(0.20)
75-34-3	1,1-DICHLOROETHANE	0.0	(0.25)
107-06-2	1,2-DICHLOROETHANE	0.0	(0.20)
75-35-4	1,1-DICHLOROETHENE	0.0	(0.40)
156-60-5	trans,1,2-DICHLOROETHENE	0.0	(0.25)
78-87-5	1,2-DICHLOROPROPANE	0.0	(0.40)
10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	(0.50)
10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	(0.50)
100-41-1	ETHYLBENZENE	2.7	(0.20)
75-09-2	DICHLOROMETHANE	0.0	(0.50)
79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	(0.24)
127-18-4	TETRACHLOROETHENE	0.0	(0.14)
108-88-3	TOLUENE	4.6	(0.20)
71-55-6	1,1,1-TRICHLOROETHANE	.8	(0.30)
79-00-5	1,1,2-TRICHLOROETHANE	0.0	(0.30)
79-01-6	TRICHLOROETHENE	.4	(0.20)
75-01-4	VINYL CHLORIDE	0.0	(0.17)

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
A value of 0.0 = BMDL (BELOW METHOD DETECTION LIMIT)

LYLE A. JOHNSON - Chemist

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 001-041591/ CSY-FMW #2 N NAVAL BASE
DATA FILE: >4B01A::D3
DATE REPORTED: 4/16/91 12:27
DILUTION FACT: 1.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 625
BASE/NEUTRALS AND ACIDS

BASE AND NEUTRALS EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
83-32-9	ACENAPHTHENE	1.3	0.50
208-96-8	ACENAPHTHYLENE	0.0	0.50
120-12-7	ANTHRACENE	0.0	1.00
309-00-2	ALDRIN	0.0	0.75
56-55-3	BENZO(a)ANTHRACENE	0.0	1.00
205-99-2	BENZO(b)FLUORANTHENE	0.0	1.25
207-08-9	BENZO(k)FLUORANTHENE	0.0	1.25
50-32-8	BENZO(a)PYRENE	0.0	2.00
191-24-2	BENZO(ghi)PERYLENE	0.0	2.50
85-68-7	BUTYLBENZYLPHTHALATE	0.0	0.86
319-85-7	BHC-beta	0.0	0.50
319-86-8	HCH-delta	0.0	3.6
111-44-4	BIS(2-CHLOROETHYL)ETHER	0.0	0.75
11-91-1	BIS(2-CHLOROETHOXY)METHANE	0.0	0.75
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE	0.0	1.00
108-60-1	BIS(2-CHLOROISOPROPYL)ETHE	0.0	0.85
101-55-3	4-BROMODIPHENYLETHER	0.0	1.00
57-74-9	CHLORDANE	0.0	1.00
91-58-7	2-CHLORONAPHTHALENE	0.0	0.55
7005-72-3	4-CHLORODIPHENYLETHER	0.0	1.00
218-01-9	CHRYSENE	0.0	1.50
72-54-8	p'p'-DDD	0.0	1.00
72-55-9	p'p'-DDE	0.0	1.00
50-29-3	p'p'-DDT	0.0	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	0.0	5.7
84-74-2	DI-n-BUTYLPHTHALATE	0.0	1.00
541-73-1	1,3-DICHLOROBENZENE	0.0	0.50
95-50-1	1,2-DICHLOROBENZENE	0.0	0.50
106-46-7	1,4-DICHLOROBENZENE	7.2	0.75
60-57-1	DIELDRIN	0.0	1.25
84-66-2	DIETHYLPHTHALATE	0.0	0.75
131-11-3	DIMETHYLPHTHALATE	0.0	0.75
121-14-2	2,4 DINITROTOLUENE	0.0	2.50
606-20-6	2,6-DINITROTOLUENE	0.0	2.75
117-84-0	DI-n-OCTYLPHTHALATE	0.0	1.00
1031-07-8	ENDOSULFAN SULFATE	0.0	5.00
206-44-0	FLUORANTHENE	0.0	1.00
86-73-7	FLUORENE	0.0	0.50
76-44-8	HEPTACHLOR	0.0	0.80
1024-57-3	HEPTACHLOR EPOXIDE	0.0	1.00
118-74-1	HEXACHLOROBENZENE	0.0	1.00
87-68-3	HEXACHLOROBUTADIENE	0.0	1.00
67-72-1	HEXACHLOROETHANE	0.0	1.40
193-39-5	INDENO(1,2,3-cd)PYRENE	0.0	2.50
78-59-1	ISOPHORONE	0.0	0.85
91-20-3	NAPHTHALENE	2.2	0.50
8-95-3	NITROBENZENE	0.0	2.00
85-01-8	PHENANTHRENE	0.0	1.00
129-00-0	PYRENE	0.0	1.00
120-82-1	1,2,4-TRICHLOROBENZENE	0.0	1.00

POLYCHLORINATED BIPHENYLS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
12674-11-2	PCB-1016	BMDL**	30.0
11104-28-2	PCB-1221	BMDL**	30.0
11141-16-5	PCB-1232	BMDL**	30.0
53469-21-9	PCB-1242	BMDL**	30.0
12672-29-6	PCB-1248	BMDL**	30.0
11097-69-1	PCB-1254	BMDL**	30.0
11096-82-5	PCB-1260	BMDL**	30.0

ACID EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
59-50-7	4-CHLORO-3-METHYLPHENOL	0.0	3.00
95-57-8	2-CHLOROPHENOL	0.0	1.00
120-83-2	2,4-DICHLOROPHENOL	0.0	1.50
105-67-9	2,4-DIMETHYLPHENOL	0.0	2.50
51-28-5	2,4-DINITROPHENOL	0.0	40.0
534-52-1	2-METHYL-4,6-DINITROPHENOL	0.0	20.0
88-75-5	2-NITROPHENOL	0.0	3.00
100-02-7	4-NITROPHENOL	0.0	2.50
87-86-5	PENTACHLOROPHENOL	0.0	2.75
109-95-2	PHENOL	0.0	0.50
88-06-2	2,4,6-TRICHLOROPHENOL	0.0	1.00

ADDITIONAL EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
92-87-5	BENZIDINE	0.0	40.0
319-84-6	BHC-alpha	0.0	1.00
959-98-8	ENDOSULFAN I	0.0	10.0
33213-65-9	ENDOSULFAN II	0.0	10.0
72-20-8	ENDRIN	0.0	1.25
77-47-4	HEXACHLOROCYCLOPENTADIENE	0.0	2.50
86-30-6	n-NITROSODIPHENYLAMINE	0.0	1.50
62-75-6	n-NITROSODIMETHYLAMINE	0.0	10.0
91-94-1	3,3-DICHLOROBENZIDINE	0.0	20.0
	2-METHYLNAPHTHALENE	5.5	0.5

LYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	CSY-FMW #4/NAVAL	EPA:	# FL095
SAMPLE NUMBER	002-041591	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/15/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/12/91	GEORGIA:	# 828
SAMPLE TYPE	WATER	SOUTH CAROLINA:	# 96015
SUBMITTER	FEDEX		

TEST		RESULTS	
EPA 624		POSITIVE	
EPA 625		POSITIVE	
ARSENIC	SM 304	<0.002	MG/L
CADMIUM	SM 300 SERIES	<0.001	MG/L
CHROMIUM,T	SM 300 SERIES	<0.002	MG/L
COPPER	SM 300 SERIES	.020	MG/L
LEAD, T	SM 300 SERIES	<0.002	MG/L
MERCURY	SM 300 SERIES	<0.0002	MG/L
SELENIUM	SM 300 SERIES	.003	MG/L
SILVER	SM 300 SERIES	<0.002	MG/L
ZINC	SM 300 SERIES	.05	MG/L
ANTIMONY	SM 300 SERIES	.003	MG/L
BERYLLIUM	SM 300 SERIES	<0.002	MG/L
NICKEL	SM 300 SERIES	.05	MG/L
THALLIUM	SM 304	<0.002	MG/L

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

CLIENT: WESTINGHOUSE-ENVIRO.
SAMPLE: 002-041591/ CSY-FMW #4 NAVAL BASE
DATA FILE: >41506::D4
DATE ANALYZED: 4/15/91 20:08
DILUTION FACTOR: .20000

EPA METHOD 624 - PURGEABLE ORGANICS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
71-43-2	BENZENE	6.9	(0.20)
75-27-4	BROMODICHLOROMETHANE	0.0	(0.20)
75-25-2	BROMOFORM	0.0	(0.20)
74-83-9	BROMOMETHANE	0.0	(0.50)
56-23-5	CARBON TETRACHLORIDE	0.0	(0.50)
108-90-7	CHLOROBENZENE	9.6	(0.20)
75-00-3	CHLOROETHANE	0.0	(0.50)
67-66-3	CHLOROFORM	0.0	(0.20)
74-87-3	CHLOROMETHANE	0.0	(0.50)
24-48-1	DIBROMOCHLOROMETHANE	0.0	(0.20)
5-50-1	o-DICHLOROBENZENE	.4	(0.20)
541-73-1	m-DICHLOROBENZENE	0.0	(0.20)
106-46-7	p-DICHLOROBENZENE	4.8	(0.20)
75-34-3	1,1-DICHLOROETHANE	0.0	(0.25)
107-06-2	1,2-DICHLOROETHANE	0.0	(0.20)
75-35-4	1,1-DICHLOROETHENE	0.0	(0.40)
156-60-5	trans,1,2-DICHLOROETHENE	0.0	(0.25)
78-87-5	1,2-DICHLOROPROPANE	0.0	(0.40)
10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	(0.50)
10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	(0.50)
100-41-1	ETHYLBENZENE	0.0	(0.20)
75-09-2	DICHLOROMETHANE	0.0	(0.50)
79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	(0.24)
127-18-4	TETRACHLOROETHENE	0.0	(0.14)
108-88-3	TOLUENE	.9	(0.20)
71-55-6	1,1,1-TRICHLOROETHANE	.6	(0.30)
79-00-5	1,1,2-TRICHLOROETHANE	0.0	(0.30)
79-01-6	TRICHLOROETHENE	0.0	(0.20)
75-01-4	VINYL CHLORIDE	0.0	(0.17)

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
A value of 0.0 = BMDL (BELOW METHOD DETECTION LIMIT)

LYLE A. JOHNSON - Chemist

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 002-041591/ CSY-FMW #4 NAVAL BASE
DATA FILE: >4B02A::D3
DATE REPORTED: 4/16/91 13:55
DILUTION FACT: 1.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 625
BASE/NEUTRALS AND ACIDS

BASE AND NEUTRALS EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
83-32-9	ACENAPHTHENE	4.3	0.50
208-96-8	ACENAPHTHYLENE	0.0	0.50
120-12-7	ANTHRACENE	3.0	1.00
309-00-2	ALDRIN	0.0	0.75
56-55-3	BENZO(a)ANTHRACENE	0.0	1.00
205-99-2	BENZO(b)FLUORANTHENE	0.0	1.25
207-08-9	BENZO(k)FLUORANTHENE	0.0	1.25
50-32-8	BENZO(a)PYRENE	0.0	2.00
191-24-2	BENZO(ghi)PERYLENE	0.0	2.50
85-68-7	BUTYLBENZYLPHTHALATE	0.0	0.86
319-85-7	BHC-beta	0.0	0.50
319-86-8	HCH-delta	0.0	3.6
111-44-4	BIS(2-CHLOROETHYL)ETHER	0.0	0.75
111-91-1	BIS(2-CHLOROETHOXY)METHANE	0.0	0.75
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE	0.0	1.00
108-60-1	BIS(2-CHLOROISOPROPYL)ETHE	0.0	0.85
101-55-3	4-BROMODIPHENYLETHER	0.0	1.00
57-74-9	CHLORDANE	0.0	1.00
91-58-7	2-CHLORONAPHTHALENE	0.0	0.55
7005-72-3	4-CHLORODIPHENYLETHER	0.0	1.00
218-01-9	CHRYSENE	0.0	1.50
72-54-8	p'p'-DDD	0.0	1.00
72-55-9	p'p'-DDE	0.0	1.00
50-29-3	p'p'-DDT	0.0	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	0.0	5.7
84-74-2	DI-n-BUTYLPHTHALATE	0.0	1.00
541-73-1	1,3-DICHLOROBENZENE	0.0	0.50
[illegible]50-1	1,2-DICHLOROBENZENE	0.0	0.50
[illegible]-46-7	1,4-DICHLOROBENZENE	4.5	0.75
60-57-1	DIELDRIN	0.0	1.25
84-66-2	DIETHYLPHTHALATE	0.0	0.75
131-11-3	DIMETHYLPHTHALATE	0.0	0.75
121-14-2	2,4 DINITROTOLUENE	0.0	2.50
606-20-6	2,6-DINITROTOLUENE	0.0	2.75
117-84-0	DI-n-OCTYLPHTHALATE	0.0	1.00
1031-07-8	ENDOSULFAN SULFATE	0.0	5.00
206-44-0	FLUORANTHENE	0.0	1.00
86-73-7	FLUORENE	2.2	0.50
76-44-8	HEPTACHLOR	0.0	0.80
1024-57-3	HEPTACHLOR EPOXIDE	0.0	1.00
118-74-1	HEXACHLOROBENZENE	0.0	1.00
87-68-3	HEXACHLOROBUTADIENE	0.0	1.00
67-72-1	HEXACHLOROETHANE	0.0	1.40
193-39-5	INDENO(1,2,3-cd)PYRENE	0.0	2.50
78-59-1	ISOPHORONE	0.0	0.85
91-20-3	NAPHTHALENE	1.2	0.50
98-95-3	NITROBENZENE	0.0	2.00
85-01-8	PHENANTHRENE	3.0	1.00
129-00-0	PYRENE	0.0	1.00
120-82-1	1,2,4-TRICHLOROBENZENE	0.0	1.00

POLYCHLORINATED BIPHENYLS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
12674-11-2	PCB-1016	BMDL**	30.0
11104-28-2	PCB-1221	BMDL**	30.0
11141-16-5	PCB-1232	BMDL**	30.0
53469-21-9	PCB-1242	BMDL**	30.0
12672-29-6	PCB-1248	BMDL**	30.0
11097-69-1	PCB-1254	BMDL**	30.0
11096-82-5	PCB-1260	BMDL**	30.0

ACID EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
59-50-7	4-CHLORO-3-METHYLPHENOL	0.0	
95-57-8	2-CHLOROPHENOL	0.0	
120-83-2	2,4-DICHLOROPHENOL	0.0	1.50
105-67-9	2,4-DIMETHYLPHENOL	0.0	2.50
51-28-5	2,4-DINITROPHENOL	0.0	40.0
534-52-1	2-METHYL-4,6-DINITROPHENOL	0.0	20.0
88-75-5	2-NITROPHENOL	0.0	3.00
100-02-7	4-NITROPHENOL	0.0	2.50
87-86-5	PENTACHLOROPHENOL	0.0	2.75
109-95-2	PHENOL	0.0	0.50
88-06-2	2,4,6-TRICHLOROPHENOL	0.0	1.00

ADDITIONAL EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
92-87-5	BENZIDINE	0.0	40.0
319-84-6	BHC-alpha	0.0	1.00
959-98-8	ENDOSULFAN I	0.0	10.0
33213-65-9	ENDOSULFAN II	0.0	10.0
72-20-8	ENDRIN	0.0	1.25
77-47-4	HEXACHLOROCYCLOPENTADIENE	0.0	2.50
86-30-6	n-NITROSODIPHENYLAMINE	0.0	1.50
62-75-6	n-NITROSODIMETHYLAMINE	0.0	10.0
91-94-1	3,3-DICHLOROBENZIDINE	0.0	20.0
	2-METHYLNAPHTHALENE	3.9	0.5

LYNE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION F/
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	CSY-FMW #3/NAVAL	EPA:	# FL095
SAMPLE NUMBER	003-041591	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/15/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/12/91	GEORGIA:	# 828
SAMPLE TYPE	WATER	SOUTH CAROLINA:	# 96015
SUBMITTER	FEDEX		

TEST		RESULTS	
EPA 624		POSITIVE	
EPA 625		NEGATIVE	
ARSENIC	SM 304	<0.002	MG/L
CADMIUM	SM 300 SERIES	<0.001	MG/L
CHROMIUM,T	SM 300 SERIES	<0.002	MG/L
COPPER	SM 300 SERIES	.020	MG/L
LEAD, T	SM 300 SERIES	<0.002	MG/L
MERCURY	SM 300 SERIES	<0.0002	MG/L
SELENIUM	SM 300 SERIES	<0.002	MG/L
SILVER	SM 300 SERIES	<0.002	MG/L
ZINC	SM 300 SERIES	.06	MG/L
ANTIMONY	SM 300 SERIES	<0.002	MG/L
BERYLLIUM	SM 300 SERIES	<0.002	MG/L
NICKEL	SM 300 SERIES	.04	MG/L
THALLIUM	SM 304	<0.002	MG/L

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

CLIENT: WESTINGHOUSE-ENVIRO.
SAMPLE: 003-041591/ CSY-FMW #3 NAVAL BASE
DATA FILE: >41507::D4
DATE ANALYZED: 4/15/91 20:08
DILUTION FACTOR: .20000

EPA METHOD 624 - PURGEABLE ORGANICS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
71-43-2	BENZENE	1.5	(0.20)
75-27-4	BROMODICHLOROMETHANE	0.0	(0.20)
75-25-2	BROMOFORM	0.0	(0.20)
74-83-9	BROMOMETHANE	0.0	(0.50)
56-23-5	CARBON TETRACHLORIDE	0.0	(0.50)
108-90-7	CHLOROBENZENE	7.5	(0.20)
75-00-3	CHLOROETHANE	0.0	(0.50)
67-66-3	CHLOROFORM	0.0	(0.20)
74-87-3	CHLOROMETHANE	0.0	(0.50)
124-48-1	DIBROMOCHLOROMETHANE	0.0	(0.20)
95-50-1	o-DICHLOROBENZENE	0.0	(0.20)
541-73-1	m-DICHLOROBENZENE	0.0	(0.20)
106-46-7	p-DICHLOROBENZENE	1.1	(0.20)
75-34-3	1,1-DICHLOROETHANE	0.0	(0.25)
107-06-2	1,2-DICHLOROETHANE	0.0	(0.20)
75-35-4	1,1-DICHLOROETHENE	0.0	(0.40)
156-60-5	trans,1,2-DICHLOROETHENE	0.0	(0.25)
78-87-5	1,2-DICHLOROPROPANE	0.0	(0.40)
10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	(0.50)
10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	(0.50)
100-41-1	ETHYLBENZENE	0.0	(0.20)
75-09-2	DICHLOROMETHANE	0.0	(0.50)
79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	(0.24)
127-18-4	TETRACHLOROETHENE	0.0	(0.14)
108-88-3	TOLUENE	1.7	(0.20)
71-55-6	1,1,1-TRICHLOROETHANE	.6	(0.30)
79-00-5	1,1,2-TRICHLOROETHANE	0.0	(0.30)
79-01-6	TRICHLOROETHENE	0.0	(0.20)
75-01-4	VINYL CHLORIDE	0.0	(0.17)

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
A value of 0.0 = BMDL (BELOW METHOD DETECTION LIMIT)

LYLE A. JOHNSON - Chemist

SPECTRUM

Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 003-041591/ CSY-FMW #3 NAVAL BASE
DATA FILE: >4B03A::D3
DATE REPORTED: 4/16/91 15:32
DILUTION FACT: 1.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 625
BASE/NEUTRALS AND ACIDS

BASE AND NEUTRALS EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
83-32-9	ACENAPHTHENE	0.0	0.50
208-96-8	ACENAPHTHYLENE	0.0	0.50
120-12-7	ANTHRACENE	0.0	1.00
309-00-2	ALDRIN	0.0	0.75
56-55-3	BENZO(a)ANTHRACENE	0.0	1.00
205-99-2	BENZO(b)FLUORANTHENE	0.0	1.25
207-08-9	BENZO(k)FLUORANTHENE	0.0	1.25
50-32-8	BENZO(a)PYRENE	0.0	2.00
191-24-2	BENZO(ghi)PERYLENE	0.0	2.50
85-68-7	BUTYLBENZYLPHTHALATE	0.0	0.86
319-85-7	BHC-beta	0.0	0.50
319-86-8	HCH-delta	0.0	3.6
1-44-4	BIS(2-CHLOROETHYL)ETHER	0.0	0.75
1-91-1	BIS(2-CHLOROETHOXY)METHANE	0.0	0.75
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE	0.0	1.00
108-60-1	BIS(2-CHLOROISOPROPYL)ETHE	0.0	0.85
101-55-3	4-BROMODIPHENYLETHER	0.0	1.00
57-74-9	CHLORDANE	0.0	1.00
91-58-7	2-CHLORONAPHTHALENE	0.0	0.55
7005-72-3	4-CHLORODIPHENYLETHER	0.0	1.00
218-01-9	CHRYSENE	0.0	1.50
72-54-8	p'p'-DDD	0.0	1.00
72-55-9	p'p'-DDE	0.0	1.00
50-29-3	p'p'-DDT	0.0	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	0.0	5.7
84-74-2	DI-n-BUTYLPHTHALATE	0.0	1.00
541-73-1	1,3-DICHLOROBENZENE	0.0	0.50
95-50-1	1,2-DICHLOROBENZENE	0.0	0.50
106-46-7	1,4-DICHLOROBENZENE	0.0	0.75
60-57-1	DIELDRIN	0.0	1.25
84-66-2	DIETHYLPHTHALATE	0.0	0.75
131-11-3	DIMETHYLPHTHALATE	0.0	0.75
121-14-2	2,4 DINITROTOLUENE	0.0	2.50
606-20-6	2,6-DINITROTOLUENE	0.0	2.75
117-84-0	DI-n-OCTYLPHTHALATE	0.0	1.00
1031-07-8	ENDOSULFAN SULFATE	0.0	5.00
206-44-0	FLUORANTHENE	0.0	1.00
86-73-7	FLUORENE	0.0	0.50
76-44-8	HEPTACHLOR	0.0	0.80
1024-57-3	HEPTACHLOR EPOXIDE	0.0	1.00
118-74-1	HEXACHLOROBENZENE	0.0	1.00
87-68-3	HEXACHLOROBUTADIENE	0.0	1.00
67-72-1	HEXACHLOROETHANE	0.0	1.40
193-39-5	INDENO(1,2,3-cd)PYRENE	0.0	2.50
8-59-1	ISOPHORONE	0.0	0.85
-20-3	NAPHTHALENE	0.0	0.50
-95-3	NITROBENZENE	0.0	2.00
85-01-8	PHENANTHRENE	0.0	1.00
129-00-0	PYRENE	0.0	1.00
120-82-1	1,2,4-TRICHLOROBENZENE	0.0	1.00

POLYCHLORINATED BIPHENYLS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
12674-11-2	PCB-1016	BMDL**	30.0
11104-28-2	PCB-1221	BMDL**	30.0
11141-16-5	PCB-1232	BMDL**	30.0
53469-21-9	PCB-1242	BMDL**	30.0
12672-29-6	PCB-1248	BMDL**	30.0
11097-69-1	PCB-1254	BMDL**	30.0
11096-82-5	PCB-1260	BMDL**	30.0

ACID EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
59-50-7	4-CHLORO-3-METHYLPHENOL	0.0	3.00
95-57-8	2-CHLOROPHENOL	0.0	1.00
120-83-2	2,4-DICHLOROPHENOL	0.0	1.50
105-67-9	2,4-DIMETHYLPHENOL	0.0	2.50
51-28-5	2,4-DINITROPHENOL	0.0	40.0
534-52-1	2-METHYL-4,6-DINITROPHENOL	0.0	20.0
88-75-5	2-NITROPHENOL	0.0	3.00
100-02-7	4-NITROPHENOL	0.0	2.50
87-86-5	PENTACHLOROPHENOL	0.0	2.75
109-95-2	PHENOL	0.0	0.50
88-06-2	2,4,6-TRICHLOROPHENOL	0.0	1.00

ADDITIONAL EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
92-87-5	BENZIDINE	0.0	40.0
319-84-6	BHC-alpha	0.0	1.00
959-98-8	ENDOSULFAN I	0.0	10.0
33213-65-9	ENDOSULFAN II	0.0	10.0
72-20-8	ENDRIN	0.0	1.25
77-47-4	HEXACHLOROCYCLOPENTADIENE	0.0	2.50
86-30-6	n-NITROSODIPHENYLAMINE	0.0	1.50
62-75-6	n-NITROSODIMETHYLAMINE	0.0	10.0
91-94-1	3,3-DICHLOROBENZIDINE	0.0	20.0
	2-METHYLNAPHTHALENE	0.0	0.5

LYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT	WESTINGHOUSE	DATE REPORTED:	04/18/91
SAMPLE LOCATION	CSY-FMW #1/NAVAL	EPA:	# FL095
SAMPLE NUMBER	004-041591	FL DRINKING WATER:	# 86144
DATE RECEIVED	04/15/91	FL ENVIRONMENTAL:	# E86006
DATE SAMPLED	04/12/91	GEORGIA:	# 828
SAMPLE TYPE	WATER	SOUTH CAROLINA:	# 96015
SUBMITTER	FEDEX		

TEST		RESULTS	
EPA 624		POSITIVE	
EPA 625		POSITIVE	
ARSENIC	SM 304	<0.002	MG/L
CADMIUM	SM 300 SERIES	<0.001	MG/L
CHROMIUM,T	SM 300 SERIES	<0.002	MG/L
COPPER	SM 300 SERIES	.040	MG/L
LEAD, T	SM 300 SERIES	<0.002	MG/L
MERCURY	SM 300 SERIES	<0.0002	MG/L
SELENIUM	SM 300 SERIES	<0.002	MG/L
SILVER	SM 300 SERIES	<0.002	MG/L
ZINC	SM 300 SERIES	.06	MG/L
ANTIMONY	SM 300 SERIES	.003	MG/L
BERYLLIUM	SM 300 SERIES	<0.002	MG/L
NICKEL	SM 300 SERIES	.04	MG/L
THALLIUM	SM 304	<0.002	MG/L

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT ME.

DONALD S. MCCORQUODALE, JR. PH.D.
MICROBIOLOGIST

SPECTRUM
Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING WATER: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

CLIENT: WESTINGHOUSE-ENVIRO.
SAMPLE: 004-041591/ CSY-FMW #1 NAVAL BASE
DATA FILE: >41508::D4
DATE ANALYZED: 4/15/91 20:08
DILUTION FACTOR: .20000

EPA METHOD 624 - PURGEABLE ORGANICS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
71-43-2	BENZENE	1.9	(0.20)
75-27-4	BROMODICHLOROMETHANE	0.0	(0.20)
75-25-2	BROMOFORM	0.0	(0.20)
74-83-9	BROMOMETHANE	0.0	(0.50)
56-23-5	CARBON TETRACHLORIDE	0.0	(0.50)
108-90-7	CHLOROBENZENE	1.7	(0.20)
75-00-3	CHLOROETHANE	0.0	(0.50)
67-66-3	CHLOROFORM	0.0	(0.20)
[illegible]-87-3	CHLOROMETHANE	0.0	(0.50)
[illegible]4-48-1	DIBROMOCHLOROMETHANE	0.0	(0.20)
[illegible]-50-1	o-DICHLOROBENZENE	0.0	(0.20)
541-73-1	m-DICHLOROBENZENE	0.0	(0.20)
106-46-7	p-DICHLOROBENZENE	.3	(0.20)
75-34-3	1,1-DICHLOROETHANE	0.0	(0.25)
107-06-2	1,2-DICHLOROETHANE	0.0	(0.20)
75-35-4	1,1-DICHLOROETHENE	0.0	(0.40)
156-60-5	trans,1,2-DICHLOROETHENE	0.0	(0.25)
78-87-5	1,2-DICHLOROPROPANE	0.0	(0.40)
10061-01-5	cis,1,3-DICHLOROPROPENE	0.0	(0.50)
10061-02-6	trans,1,3-DICHLOROPROPENE	0.0	(0.50)
100-41-1	ETHYLBENZENE	0.0	(0.20)
75-09-2	DICHLOROMETHANE	0.0	(0.50)
79-34-5	1,1,2,2-TETRACHLOROETHANE	0.0	(0.24)
127-18-4	TETRACHLOROETHENE	0.0	(0.14)
108-88-3	TOLUENE	2.2	(0.20)
71-55-6	1,1,1-TRICHLOROETHANE	0.0	(0.30)
79-00-5	1,1,2-TRICHLOROETHANE	0.0	(0.30)
79-01-6	TRICHLOROETHENE	0.0	(0.20)
75-01-4	VINYL CHLORIDE	0.0	(0.17)

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FACTOR
A value of 0.0 = BMDL (BELOW METHOD DETECTION LIMIT)

LYLE A. JOHNSON - Chemist

SPECTRUM Laboratories, Inc. FORT LAUDERDALE • SAVANNAH

CLIENT: WESTINGHOUSE ENVIRO.
SAMPLE: 004-041591/ CSY-FMW #1 NAVAL BASE
DATA FILE: >4B04A::D3
DATE REPORTED: 4/16/91 17:07
DILUTION FACT: 1.00000

-CERTIFICATIONS-
EPA: #FL095
FL DRINKING: #86144
FL ENVIRONMENTAL: #E86006
GA # 828
SC # 96015

EPA METHOD 625
BASE/NEUTRALS AND ACIDS

BASE AND NEUTRALS EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
83-32-9	ACENAPHTHENE	0.0	0.50
208-96-8	ACENAPHTHYLENE	0.0	0.50
120-12-7	ANTHRACENE	1.1	1.00
309-00-2	ALDRIN	0.0	0.75
56-55-3	BENZO(a)ANTHRACENE	0.0	1.00
205-99-2	BENZO(b)FLUORANTHENE	0.0	1.25
207-08-9	BENZO(k)FLUORANTHENE	0.0	1.25
50-32-8	BENZO(a)PYRENE	0.0	2.00
191-24-2	BENZO(ghi)PERYLENE	0.0	2.50
85-68-7	BUTYLBENZYLPHTHALATE	0.0	0.86
319-85-7	BHC-beta	0.0	0.50
319-86-8	HCH-delta	0.0	3.6
111-44-4	BIS(2-CHLOROETHYL)ETHER	0.0	0.75
111-91-1	BIS(2-CHLOROETHOXY)METHANE	0.0	0.75
117-81-7	DI(2-ETHYLHEXYL)PHTHALATE	0.0	1.00
108-60-1	BIS(2-CHLORDISOPROPYL)ETHE	0.0	0.85
101-55-3	4-BROMODIPHENYLETHER	0.0	1.00
57-74-9	CHLORDANE	0.0	1.00
91-58-7	2-CHLORONAPHTHALENE	0.0	0.55
7005-72-3	4-CHLORODIPHENYLETHER	0.0	1.00
218-01-9	CHRYSENE	0.0	1.50
72-54-8	p'p'-DDD	0.0	1.00
72-55-9	p'p'-DDE	0.0	1.00
50-29-3	p'p'-DDT	0.0	1.00
53-70-3	DIBENZO(ah)ANTHRACENE	0.0	5.7
84-74-2	DI-n-BUTYLPHTHALATE	0.0	1.00
541-73-1	1,3-DICHLOROBENZENE	0.0	0.50
95-50-1	1,2-DICHLOROBENZENE	0.0	0.50
106-46-7	1,4-DICHLOROBENZENE	0.0	0.75
60-57-1	DIELDRIN	0.0	1.25
84-66-2	DIETHYLPHTHALATE	0.0	0.75
131-11-3	DIMETHYLPHTHALATE	0.0	0.75
121-14-2	2,4 DINITROTOLUENE	0.0	2.50
606-20-6	2,6-DINITROTOLUENE	0.0	2.75
117-84-0	DI-n-OCTYLPHTHALATE	0.0	1.00
1031-07-8	ENDOSULFAN SULFATE	0.0	5.00
206-44-0	FLUORANTHENE	0.0	1.00
86-73-7	FLUORENE	0.0	0.50
76-44-8	HEPTACHLOR	0.0	0.80
1024-57-3	HEPTACHLOR EPOXIDE	0.0	1.00
118-74-1	HEXACHLOROBENZENE	0.0	1.00
87-68-3	HEXACHLOROBUTADIENE	0.0	1.00
67-72-1	HEXACHLOROETHANE	0.0	1.40
193-39-5	INDENO(1,2,3-cd)PYRENE	0.0	2.50
78-59-1	ISOPHORONE	0.0	0.85
91-20-3	NAPHTHALENE	0.0	0.50
98-95-3	NITROBENZENE	0.0	2.00
85-01-8	PHENANTHRENE	1.1	1.00
129-00-0	PYRENE	0.0	1.00
120-82-1	1,2,4-TRICHLOROBENZENE	0.0	1.00

POLYCHLORINATED BIPHENYLS

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
12674-11-2	PCB-1016	BMDL**	30.0
11104-28-2	PCB-1221	BMDL**	30.0
11141-16-5	PCB-1232	BMDL**	30.0
53469-21-9	PCB-1242	BMDL**	30.0
12672-29-6	PCB-1248	BMDL**	30.0
11097-69-1	PCB-1254	BMDL**	30.0
11096-82-5	PCB-1260	BMDL**	30.0

ACID EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
59-50-7	4-CHLORO-3-METHYLPHENOL	0.0	
95-57-8	2-CHLOROPHENOL	0.0	1.[illegible]
120-83-2	2,4-DICHLOROPHENOL	0.0	1.50
105-67-9	2,4-DIMETHYLPHENOL	0.0	2.50
51-28-5	2,4-DINITROPHENOL	0.0	40.0
534-52-1	2-METHYL-4,6-DINITROPHENOL	0.0	20.0
88-75-5	2-NITROPHENOL	0.0	3.00
100-02-7	4-NITROPHENOL	0.0	2.50
87-86-5	PENTACHLOROPHENOL	0.0	2.75
109-95-2	PHENOL	0.0	0.50
88-06-2	2,4,6-TRICHLOROPHENOL	0.0	1.00

ADDITIONAL EXTRACTABLES

CAS No.	PARAMETER	CONCENTRATION (ug/l)	*MDL (ug/l)
92-87-5	BENZIDINE	0.0	40.0
319-84-6	BHC-alpha	0.0	1.00
959-98-8	ENDOSULFAN I	0.0	10.0
33213-65-9	ENDOSULFAN II	0.0	10.0
72-20-8	ENDRIN	0.0	1.25
77-47-4	HEXACHLOROCYCLOPENTADIENE	0.0	2.50
86-30-6	n-NITROSODIPHENYLAMINE	0.0	1.50
62-75-6	n-NITROSODIMETHYLAMINE	0.0	10.0
91-94-1	3,3-DICHLOROBENZIDINE	0.0	20.0
	2-METHYLNAPHTHALENE	0.0	0.5

LYLE A. JOHNSON - Chemist

* ACTUAL DETECTION LIMIT = METHOD DETECTION LIMIT x DILUTION FAC
** BMDL - BELOW METHOD DETECTION LIMIT (A value of 0.0 = BMDL)

APPENDIX J

Caustic Pond - Analytical Data

(Source: Reference 12)

GENERAL ENGINEERING LABORATORIES

Full Service Chemical Testing and Analysis

Office & Lab.
1313 Ashley River Road
Charleston, S.C.
Phone (803) 556-8171

Mailing Address
P.O. Box 30712
Charleston, S.C. 29407

Analysis Sheet

Client Geraghty & Miller, Inc.
P.O. Box 271173
Tampa, Florida 33688

Date August 4, 1981
P.O. No.
Requested by Mr. Phil Ciaravella

Sample Identification — Results

Analysis of Monitoring Wells
(July 28, 9181)

	CP-1	CP-2	CP-3	CP-4
ph	6.5	6.3	6.75	7.3
Conductivity, MMHOS/CM	3100	7400	1970	2700
Calcium, mg/L	250	490	192	101
Chloride, mg/L	670	1340	423	823
Sulfate, mg/L	279	552	116	124

By George C. Greene

George C. Greene, PhD

APPENDIX K

Chemical Disposal Area - Analytical Data

(Source: Reference 12)

ENERGY RESOURCES CO. INC

TRACE METAL ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller
Charleston, S.C.

mg/l unless otherwise stated

ERCO ID	CLIENT ID	F	NO^3	SO_4	TOC	COND umhos/cm
51-915a	CD-1	0.46	<0.01	26	110	27,000
51-916	CD-2	0.57	0.02	<1	110	32,000
51-917	CD-3	0.13	0.23	4	63	1,900
51-918	CD-4	0.71	<0.01	400	190	11,000
51-919	CD-5	0.69	<0.01	61	170	14,000

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID #.

Sample Rcvd. 7/30/81 Reported by Nat

Date Analysis Completed 8/25/81 Checked by Kah

ENERGY RESOURCES CO. INC

TRACE METAL ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller
Charleston, S.C.

ug/l unless otherwise stated

ERCO ID	CLIENT ID	Cd	Fe	Pb	Mg mg/l	Hg	Na mg/l
51-915a	CD-1	<1	200	<5	800	<0.1	5500
51-916	CD-2	<1	400	<5	820	<0.1	6300
51-917	CD-3	<1	46	<5	260	<0.1	2200
51-918	CD-4	<1	130	<5	280	<0.1	2500
51-919	CD-5	<1	1200	<5	280	<0.1	2800

If customer has any questions regarding analysis, refer to sample in question by its ERCO ID #.

Sample Rcvd. 7/30/81 Reported by NaL

Date Analysis Completed 8/25/81 Checked by Fah

ENERGY RESOURCES CO. INC.

INORGANIC CHEMISTRY LABORATORY

- Report of Chemical Analyses -

Client: Geraghty & Miller
Charleston, S.C.

ERCO ID	Client ID	Cl Concentration (gm/l)
51-915[a]	CD-1	7.3
51-916	CD-2	6.6
51-917	CD-3	0.2
51-918	CD-4	1.9
51-919	CD-5	2.7

Sample Rcvd. 7/30/81
Date Completed 8/25/81
Date of this rpt. 5/4/82

Reported by Kah

Checked by

Sample Rcvd: 7/30/81

Date Analysis Completed: 8/7/81

All Results In: mg/l

Reported By:

Checked By:

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Analyzed for: Geraghty & Miller

Compounds (in order of elution)	CD-1	CD-2	CD-3	CD-4	CD-5
Vinyl chloride					
Methylene chloride	0.58	0.32			
1,1-dichloroethylene					
1,1-dichloroethane					
trans-1,2-dichloroethylene					
1,2-dichloroethane					
1,1,1-trichloroethane					
1,2-Dichloropropane					
Trichloroethylene					
1,1,2-Trichloroethane					
Tetrachloroethylene					
Chlorobenzene			0.14	10.68	
Unknown	0.20				

Comments: All blank spaces are ND's (none detected) (<0.05 mg/l, or 50 ppb)

Sample Rcvd: 2/12/82

Date Analysis Completed: 2/23/82

All Results In: µg/l (ppb)

Reported By:

Checked By:

ENERGY RESOURCES CO. INC.

VOLATILE ORGANICS ANALYSIS

- Report Sheet -

Analyzed for: G & M SC Navy

Compounds (in order of elution)	CD-1 13-1239	CD-2 13-1240	CD-3 13-1241	CD-4 13-1242	CD-5 13-1246
Vinyl chloride					
Methylene chloride	28	2000	7.5	1800	1500
1,1-dichloroethylene					
1,1-dichloroethane					
1,2-dichloroethylene					
Chloroform			1.5		
1,2-dichloroethane					
1,1,1-trichloroethane					
Carbon tetrachloride					
Bromodichloromethane					
Trichloroethylene					
Dibromochloromethane					
Bromoform					
Tetrachloroethylene					

Comments: All blank spaces are ND's (r[illegible] detected).

ENERGY RESOURCES CO.,INC.
SUMMARY OF BASE/NEUTRAL PRIORITY POLLUTANTS

CLIENT: Geraghty & Miller

CLIENT I.D.: CD 1 DATE SAMPLE RECEIVED: 2/12/82

ERCO I.D.: 13-1239 DATE SAMPLE COMPLETED: 2/28/82

	BASE/NEUTRAL	ug/l		BASE/NEUTRAL	ug/
3	acenaphthene	ND	68B	di-n-butyl phthalate	NI
3	benzidine	ND	69B	di-n-octyl phthalate	NI
9	1,2,4-trichlorobenzene	ND	70B	diethyl phthalate	*
3	hexachlorobenzene	ND	71B	dimethyl phthalate	NI
2B	hexachloroethane	ND	72B	benzo(a)anthracene	NI
3B	bis(2-chloroethyl)ether	ND	73B	benzo(a)pyrene	NI
20B	2-chloronaphthalene	ND	74B	3,4-benzofluoranthene	NI
5B	1,2-dichlorobenzene	ND	75B	benzo(k)fluoranthene	NI
2	1,3-dichlorobenzene	ND	76B	chrysene	NI
	1,4-dichlorobenzene	ND	77B	acenaphthylene	NI
28B	3,3-dichlorobenzidine	ND	78B	anthracene	NI
5B	2,4-dinitrotoluene	ND	79B	benzo(ghi)perylene	NI
6B	2,6-dinitrotoluene	ND	80B	fluorene	NI
7B	1,2-diphenylhydrazine	ND	81B	phenanthrene	NI
9B	fluoranthene	ND	82B	dibenzo(a,h)anthracene	NI
0B	4-chlorophenyl phenyl ether	ND	83B	indeno(1,2,3-cd)pyrene	NI
1B	4-bromophenyl phenyl ether	ND	84B	pyrene	NI
2B	bis(2-chloroisopropyl)ether	ND	129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	NI
3B	bis(2-chloroethoxy)methane	ND			
2B	hexachlorobutadiene	ND			
3B	hexachlorocyclopentadiene	ND			
4B	isophorone	ND			
5B	naphthalene	ND			
6B	nitrobenzene	ND			
	N-nitrosodimethylamine	ND			
	N-nitrosodiphenylamine	ND			
3B	N-nitrosodi-n-propylamine	ND			
6B	bis(2-ethylhexyl)phthalate	*			

ND = Not Detected

NA = Not Applicable

* = 1-9 ug/l

Reported by: [illegible]

Checked by: C. Lodgen

ENERGY RESOURCES CO.,INC.
SUMMARY OF BASE/NEUTRAL PRIORITY POLLUTANTS

CLIENT: Geraghty & Miller

CLIENT I.D.: CD 2 DATE SAMPLE RECEIVED: 2/12/82

ERCO I.D.: 13-1240 DATE SAMPLE COMPLETED: 2/28/82

	BASE/NEUTRAL	ug/l
3	acenaphthene	ND
2B	benzidine	ND
3	1,2,4-trichlorobenzene	ND
3	hexachlorobenzene	ND
2B	hexachloroethane	ND
3B	bis(2-chloroethyl)ether	ND
20B	2-chloronaphthalene	ND
5B	1,2-dichlorobenzene	ND
26B	1,3-dichlorobenzene	ND
7B	1,4-dichlorobenzene	ND
28B	3,3-dichlorobenzidine	ND
5B	2,4-dinitrotoluene	ND
6B	2,6-dinitrotoluene	ND
7B	1,2-diphenylhydrazine	ND
9B	fluoranthene	ND
0B	4-chlorophenyl phenyl ether	ND
1B	4-bromophenyl phenyl ether	ND
2B	bis(2-chloroisopropyl)ether	ND
3B	bis(2-chloroethoxy)methane	ND
2B	hexachlorobutadiene	ND
3B	hexachlorocyclopentadiene	ND
4B	isophorone	ND
5B	naphthalene	ND
6B	nitrobenzene	ND
1B	N-nitrosodimethylamine	ND
2B	N-nitrosodiphenylamine	ND
3B	N-nitrosodi-n-propylamine	ND
5B	bis(2-ethylhexyl)phthalate	34

	BASE/NEUTRAL	ug/
68B	di-n-butyl phthalate	NI
69B	di-n-octyl phthalate	NI
70B	diethyl phthalate	*
71B	dimethyl phthalate	NI
72B	benzo(a)anthracene	NI
73B	benzo(a)pyrene	NI
74B	3,4-benzofluoranthene	NI
75B	benzo(k)fluoranthene	NI
76B	chrysene	NI
77B	acenaphthylene	
78B	anthracene	NI
79B	benzo(ghi)perylene	NI
80B	fluorene	NI
81B	phenanthrene	NI
82B	dibenzo(a,h)anthracene	NI
83B	indeno(1,2,3-cd)pyrene	NI
84B	pyrene	NI
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	NI

ND = Not Detected

NA = Not Applicable

* = 1-9 ug/l

Reported by: [illegible]

Checked by: C. Lodge

ENERGY RESOURCES CO.,INC.
SUMMARY OF BASE/NEUTRAL PRIORITY POLLUTANTS

:NT: Geraghty & Miller

:NT I.D.: CD 3 DATE SAMPLE RECEIVED: 2/12/82

I.D.: 13-1241 DATE SAMPLE COMPLETED: 2/28/82

BASE/NEUTRAL	ug/l		BASE/NEUTRAL	ug/l
aphthene	ND	68B	di-n-butyl phthalate	*
idine	ND	69B	di-n-octyl phthalate	ND
4-trichlorobenzene	ND	70B	diethyl phthalate	*
chlorobenzene	ND	71B	dimethyl phthalate	*
chloroethane	ND	72B	benzo(a)anthracene	ND
2-chloroethyl)ether	ND	73B	benzo(a)pyrene	ND
loronaphthalene	ND	74B	3,4-benzofluoranthene	ND
ichlorobenzene	ND	75B	benzo(k)fluoranthene	ND
lorobenzene	ND	76B	chrysene	ND
dichlorobenzene	ND	77B	acenaphthylene	ND
dichlorobenzidine	ND	78B	anthracene	ND
dinitrotoluene	ND	79B	benzo(ghi)perylene	ND
dinitrotoluene	ND	80B	fluorene	ND
diphenylhydrazine	ND	81B	phenanthrene	ND
anthene	ND	82B	dibenzo(a,h)anthracene	ND
lorophenyl phenyl ether	ND	83B	indeno(1,2,3-cd)pyrene	ND
omophenyl phenyl ether	ND	84B	pyrene	ND
2-chloroisopropyl)ether	ND	129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND
2-chloroethoxy)methane	ND			
hlorobutadiene	ND			
hlorocyclopentadiene	ND			
orone	ND			
halene	*			
benzene	ND			
dimethylamine	ND			
rosodiphenylamine	ND			
rosodi-n-propylamine	ND			
-ethylhexyl)phthalate	*			

ND = Not Detected
NA = Not Applicable
* = 1-9 ug/l

Reported by: NM

Checked by: C. Ryan

ENERGY RESOURCES CO.,INC.
SUMMARY OF BASE/NEUTRAL PRIORITY POLLUTANTS

CLIENT: Geraghty & Miller

CLIENT I.D.: CD 4 DATE SAMPLE RECEIVED: 2/12/82

ERCO I.D.: 13-1242 DATE SAMPLE COMPLETED: 2/28/82

	BASE/NEUTRAL	ug/l
1B	acenaphthene	ND
B	benzidine	ND
3B	1,2,4-trichlorobenzene	ND
B	hexachlorobenzene	ND
12B	hexachloroethane	ND
8B	bis(2-chloroethyl)ether	ND
20B	2-chloronaphthalene	ND
5B	1,2-dichlorobenzene	ND
6B	1,3-dichlorobenzene	ND
7B	1,4-dichlorobenzene	ND
8B	3,3-dichlorobenzidine	ND
5B	2,4-dinitrotoluene	ND
6B	2,6-dinitrotoluene	ND
7B	1,2-diphenylhydrazine	ND
9B	fluoranthene	ND
0B	4-chlorophenyl phenyl ether	ND
1B	4-bromophenyl phenyl ether	ND
2B	bis(2-chloroisopropyl)ether	ND
3B	bis(2-chloroethoxy)methane	ND
2B	hexachlorobutadiene	ND
3B	hexachlorocyclopentadiene	ND
4B	isophorone	ND
5B	naphthalene	ND
6B	nitrobenzene	ND
1B	N-nitrosodimethylamine	ND
2B	N-nitrosodiphenylamine	ND
3B	N-nitrosodi-n-propylamine	ND
6B	bis(2-ethylhexyl)phthalate	15
7B	butyl benzyl phthalate	ND

	BASE/NEUTRAL	ug
68B	di-n-butyl phthalate	*
69B	di-n-octyl phthalate	N
70B	diethyl phthalate	*
71B	dimethyl phthalate	N
72B	benzo(a)anthracene	N
73B	benzo(a)pyrene	N
74B	3,4-benzofluoranthene	N
75B	benzo(k)fluoranthene	N
76B	chrysene	N
77B	acenaphthylene	
78B	anthracene	N
79B	benzo(ghi)perylene	N
80B	fluorene	N
81B	phenanthrene	N
82B	dibenzo(a,h)anthracene	N
83B	indeno(1,2,3-cd)pyrene	N
84B	pyrene	N
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	N

ND = Not Detected
NA = Not Applicable
* = 1-9 ug/l

Reported by: [illegible]
Checked by: C. Lodge

ENERGY RESOURCES CO.,INC.
SUMMARY OF BASE/NEUTRAL PRIORITY POLLUTANTS

ENT: Geraghty & Miller

ENT I.D.: CD 5 DATE SAMPLE RECEIVED: 2/12/82

D I.D.: 13-1246 DATE SAMPLE COMPLETED: 2/28/82

BASE/NEUTRAL	ug/l		BASE/NEUTRAL	ug/l
naphthene	ND	68B	di-n-butyl phthalate	*
zidine	ND	69B	di-n-octyl phthalate	ND
,4-trichlorobenzene	ND	70B	diethyl phthalate	*
achlorobenzene	ND	71B	dimethyl phthalate	ND
achloroethane	ND	72B	benzo(a)anthracene	ND
(2-chloroethyl)ether	ND	73B	benzo(a)pyrene	ND
aloronaphthalene	ND	74B	3,4-benzofluoranthene	ND
-dichlorobenzene	ND	75B	benzo(k)fluoranthene	ND
hlorobenzene	ND	76B	chrysene	ND
-dichlorobenzene	ND	77B	acenaphthylene	ND
-dichlorobenzidine	ND	78B	anthracene	ND
-dinitrotoluene	ND	79B	benzo(ghi)perylene	ND
dinitrotoluene	ND	80B	fluorene	ND
diphenylhydrazine	ND	81B	phenanthrene	ND
ranthene	ND	82B	dibenzo(a,h)anthracene	ND
lorophenyl phenyl ether	ND	83B	indeno(1,2,3-cd)pyrene	ND
omophenyl phenyl ether	ND	84B	pyrene	ND
2-chloroisopropyl)ether	ND	129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND
2-chloroethoxy)methane	ND			
chlorobutadiene	ND			
chlorocyclopentadiene	ND			
horone	ND			
thalene	ND			
obenzene	ND			
odimethylamine	ND			
trosodiphenylamine	ND			
trosodi-n-propylamine	ND			
2-ethylhexyl)phthalate	*			

ND = Not Detected
NA = Not Applicable
* = 1-9 ug/l

Reported by: NM

Checked by: C. Ridgeway

pH MEASUREMENTS OF WATER SAMPLES
COLLECTED FROM MONITOR WELLS
AT THE CHEMICAL-DISPOSAL AREA[1]

Well Number	pH 7/27/81	pH 2/11/82
CD-1	6.85	7.22
CD-2	6.85	7.10
CD-3	7.45	8.63
CD-4	7.30	7.15
CD-5	7.30	6.68

[1] Measured at the time of sample collection.

APPENDIX L

Environmental Incident Reports

#87-88 and #87-53-B

PCB Transformer Oil Spill

5090
Ser 461.3/463
13 AUG 1987

MEMORANDUM

From: Code 461.3
To: File
Via: (1) Code 460
(2) Code 461

Subj: ENVIRONMENTAL INCIDENT REPORT #87-53-B

Ref: (a) Environmental Incident Report #87-53 dtd 25 Jun 87
(b) Spill Report prepared by AmerEco dtd 22 Jun 87
(c) PHONCON AmerEco Steve Busch/CNSYD (Code 461.3) Sarah Morey of 7 Aug 87

Encl: (1) PCB Manifest Number 10138 dtd 29 Jun 87
(2) General Engineering Laboratories analytical dated 12 Aug 87

1. As shown in reference (a), twenty-two drums were filled with PCB oil contaminated soil and asphalt, samples taken as shown, and the spill site was covered with plastic sheeting by AmerEco employees. Analytical results from soil samples taken immediately after this initial cleanup, and analytical results from samples taken by AmerEco during site visit 15-17 June indicated that additional cleanup was necessary. (It is noted that the spill report, reference (b), contains several discrepancies concerning circumstances of this spill).

2. On 29 June AmerEco arranged further cleanup and removed 45,600 lbs of soil from the spill site, enclosure (1). AmerEco took samples, again splitting them with CNSYD. The spill site was again covered by AmerEco employees using 12' 2 x 4s to form a peaked cover. Analytical results indicated need for additional cleanup at five sampling points.

3. On 5 August AmerEco removed additional soil from contaminated sampling points and resampled these areas. The spill site was recovered with plastic sheeting. Samples were again split with CNSYD. Analytical results from this cleanup, enclosure (2), indicate <10 ppm PCB at all points sampled. Per reference (c), analytical by AmerEco indicate <11 ppm PCB as highest level found.

4. No further cleanup required. Spill site to be restored by AmerEco.

Sarah Morey
SARAH MOREY

Copy to:
461.3, 460 DF, PWD Circ

JOINT MESSAGEFORM

UNCLASSIFIED

PAGE				CLASS	SPECIAL		CIC	ORIGINATOR IDENT
1.	01	161209Z	SEP 87	RR	UUUU			2591900

ADMIN

CHARLESTON NAVAL SHIPYARD

COMDT COGARD WASHINGTON DC

INFO CNO WASHINGTON

COMNAVFACENGCOM ALEXANDRIA VA

COMNAVSEASYSCOM WASHINGTON DC

EPA REGION IV

NAVENENUSA PORT HUENEME CA

UNCLAS//N05090//

SUBJ: HAZARDOUS SUBSTANCE RELEASE REPORT (REPORT SYMBOL OPNAV 5090-3)

1. CNO FOR OP-45 COMNAVFACENGCOM FOR 112

2 GMT DTG RELEASE OCCURRED 141300Z SEP 87

3. CHARLESTON NAVAL SHIPYARD, CHARLESTON, SC

4. BUILDING 1278, RESOURCE RECOVERY FACILITY

5. RESOURCE RECOVERY FACILITY

6. PCB TRANSFORMER, OUT OF SERVICE

7. PCB DIELECTRIC FLUID

8. NONE

9. 2 TO 6 GALLONS

10. A PALLET LOADED ON A FORKLIFT WAS JAMMED UP AGAINST AN INSULATOR. AS A RESULT OF THIS INCIDENT THE SEAL AROUND THE INSULATOR WAS CRACKED

DRAFTER TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE: S. SCHAFER, ENGINEERING TECHNICIAN, E 461.22, X35519

INFO: 400/401|460|460 DF|PWD|CIRC|FXD|

RELEASER TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE: B.L. RUNBERG, CAPT, PWO, 400, X33841

SIGNATURE: B L Runberg

SECURITY CLASSIFICATION: UNCLASSIFIED

DATE TIME GROUP: 161209Z

JOINT MESSAGEFORM

SECURITY CLASSIFICATION
UNCLASSIFIED

PAGE	DTG RELEASER TIME			PRECEDENCE	CLASS	SPECAT	LIMD	CIC	ORIG MSG IDENT
	DATE TIME	MONTH	YR	ACT	INFO				
02	161209Z	SEP	87	RR		UUUU			2591900

MESSAGE HANDLING INSTRUCTIONS

ADMIN

CAUSING THE DIELECTRIC FLUID TO SPILL OUT.

11. THE DIELECTRIC FLUID SPILLED INTO A DRIP PAN AND ONTO THE ASPHALT COVERING AN AREA APPROXIMATELY 25 SQUARE FEET. THE SPILL WAS CONTAINED AND NO POTENTIAL DANGER OR DAMAGE TO THE IMMEDIATE AREA AND THE SURROUNDING ENVIRONMENT OCCURRED.

12. TELEPHONIC NOTIFICATIONS TO NRC, SCDHEC, COAST GUARD WERE MADE. NO ASSISTANCE REQUIRED.

13. SPILL WAS CONTAINED BY DRIP-PAN AND ABSORBENT. PUBLIC WORKS DEPARTMENT PERSONNEL CARRIED OUT CONTAINMENT ACTIONS.

14. CLEAN-UP ACTIONS WERE CARRIED OUT ON-SITE. TRANSFORMER WAS DECONTAMINATED AND THE AREA WILL BE EXCAVATED. THE EXCAVATED ASPHALT CONTAMINATED ABSORBENT WILL BE SHIPPED BY DRMO TO A PCB DISPOSAL SITE.

15. CONTACT FOR ADDITIONAL INFORMATION JOHN SNEED OR ALAN SHOULTZ, AUTOVON 563-5519.

DRAFTER TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE

RELEASER INSTRUCTIONS

TYPED NAME, TITLE, OFFICE SYMBOL AND PHONE

SIGNATURE

SECURITY CLASSIFICATION
UNCLASSIFIED

DATE TIME GROUP
161209Z

DD FORM 1733 (OCT 1)

Engineering Consulting
Chemical Analysis

GENERAL ENGINEERING LABORATORIES

1313 Ashley River Road
Charleston, S.C. 29407

P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408

DATE: 08/12/87

CONTACT: MR. WAYNE H. NEVILLE

RELEASED BY: GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB4

PAGE NO.: 1

PARAMETER	SAMPLE ID :	N102	N103	N104	N105
	LAB ID :	87080224	87080225	87080226	87080227
	DATE RECEIVED:	08/06/87	08/06/87	08/06/87	08/06/87
PCB ANALYSIS					
AROCLOR 1016		<10 ppm	<10 ppm	<10 ppm	<10 ppm
AROCLOR 1221		<10 ppm	<10 ppm	<10 ppm	<10 ppm
AROCLOR 1232		<10 ppm	<10 ppm	<10 ppm	<10 ppm
AROCLOR 1242		<10 ppm	<10 ppm	<10 ppm	<10 ppm
AROCLOR 1248		<10 ppm	<10 ppm	<10 ppm	<10 ppm
CLOR 1254		<10 ppm	<10 ppm	<10 ppm	<10 ppm
1260		<10 ppm	<10 ppm	<10 ppm	<10 ppm
AROCLOR 1262		<10 ppm	<10 ppm	<10 ppm	<10 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

GENERAL ENGINEERING LABORATORIES

1313 Ashley River Road
Charleston, S.C. 29407

P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

ncering Consulting
nical Analysis

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408

DATE: 08/12/87

CONTACT: MR. WAYNE H. NEVILLE

RELEASED BY: for GEORGE O. GREENE PE,PHD

CC/FC: NVBA/PCB4

PAGE NO.: 1

SAMPLE ID : #106

LAB ID : 87080228

PARAMETER DATE RECEIVED: 08/06/87

PCB ANALYSIS	
AROCLOR 1016	<10 ppm
AROCLOR 1221	<10 ppm
AROCLOR 1232	<10 ppm
AROCLOR 1242	<10 ppm
AROCLOR 1248	<10 ppm
AROCLOR 1254	<10 ppm
AROCLOR 1260	<10 ppm
AROCLOR 1262	<10 ppm
EXTRACTION & CONCENTRATION	YES

5090
Ser 461.22/585
21 OCT 1987

MEMORANDUM

From: Code 461.22
To: File
Via: (1) Code 460
(2) Code 461

Subj: ENVIRONMENTAL INCIDENT REPORT #87-88

Encl: (1) Spill message report
(2) Map of spill site
(3) General Engineering Laboratories lab analysis

1. Nature of incident: PCB transformer oil spill occurred when an insolator rod was broken.

2. Location of incident: Resource Recovery Facility, building 1278

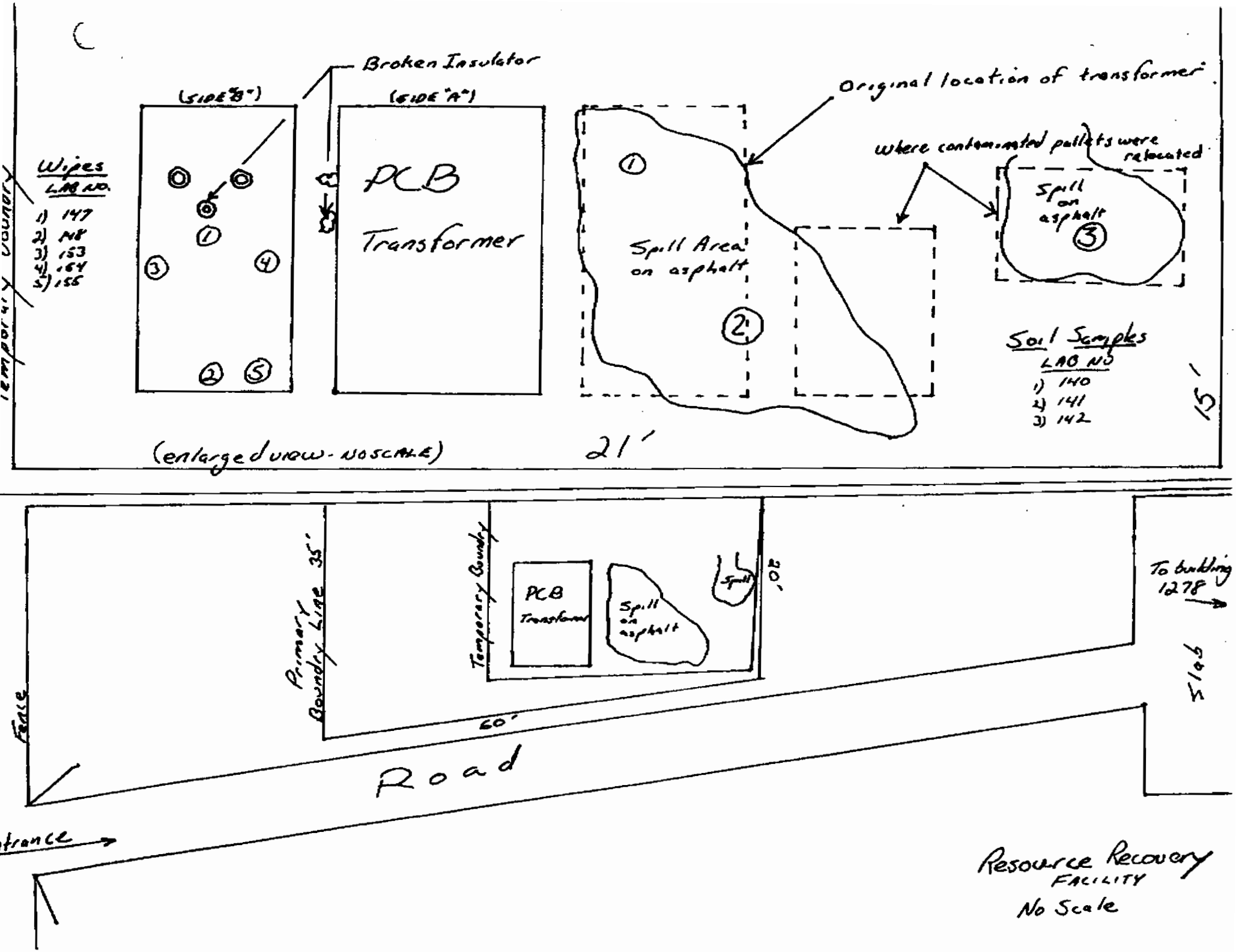
3. When notified: Date: 14 Sep 87 Time: 0830

4. Notified by: Mark Epstein, Code 462.2

5. Immediate action taken: Shop 07 personnel applied absorbent to the spill area, which was approximately 25 square feet. The transformer was partially drained off and the oil collected in three 55 gallon drums. The area was secured with plastic covering and a boundry line, enclosure (1). The National Response Center was notified by Sarah Morey and a spill message report was sent in accordance with CNSYDINST 5090.1, enclosure (1). On September 16 the spill site was excuvated and the transformer was decontaminated by Shop 07 spill response team. Samples of the soil and wipes of the transformer and equipment used for cleanup were taken to General Engineering Laboratories for PCB analysis. Location of samples and wipes taken are indicated on enclosure (2).

6. Follow-up action taken or planned: The results of the wipes taken from the transformer and cleanup equipment indicated PCB contamination above the EPA limit of 10 micrograms per 100 centimeters squared, (10 ug/100cm^2). These results are shown on GEL Laboratory report sample ID numbers 147 and 148 enclosure (3). Additional deconning of the transformer was completed September 21 and the results of the analysis indicated satisfactory limits. Sample ID numbers 153, 154 and 155 list the satisfactory results enclosure (3). The final action planned is to dispose of PCB contaminated soil and oil through DRMO contractors and recover the site with asphalt.

Scott J Schafer
SCOTT SCHAFER


Broken Insulator
(SIDE "B")
(SIDE "A")
PCB
Transformer
Wipes
LAB NO.
1) 147
2) 148
3) 153
4) 154
5) 155
Original location of transformer
where contaminated pallets were relocated
Spill Area on asphalt
Spill on asphalt
Soil Samples
LAB NO
1) 140
2) 141
3) 142
21'
15'
(enlarged view - NO SCALE)
Primary Boundary Line 35'
Temporary Boundary
PCB Transformer
Spill on asphalt
Spill
20'
60'
Fence
Road
To building 1278
Slab
Entrance
Resource Recovery FACILITY
No Scale

Engineering Consulting
Chemical Analysis

GENERAL ENGINEERING LABORATORIES

1313 Ashley River Road
Charleston, S.C. 29407

P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408

DATE: 09/21/87

CONTACT: MR. SCOTT SCHAFER

RELEASED BY: GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB1

PAGE NO.: 1

	SAMPLE ID :	#140	#141	#142
	LAB ID :	87090835	87090836	87090837
PARAMETER	DATE RECEIVED:	09/17/87	09/17/87	09/17/87
AROCLOR 1016		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1221		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1232		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1242		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1248		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1254		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1260		<50 ppm	<50 ppm	<50 ppm
AROCLOR 1262		<50 ppm	<50 ppm	<50 ppm
EXTRACTION & CONCENTRATION		YES	YES	YES

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Charleston, S.C. 29407
P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

Engineering Consulting
Chemical Analysis

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408
CONTACT: MR. SCOTT SCHAFER

DATE: 09/21/87

RELEASED BY: G. M. Greene
GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB2

PAGE NO.: 1

PARAMETER	SAMPLE ID :	#144	#145	#146	#147
	LAB ID :	87090839	87090840	87090841	87090842
	DATE RECEIVED:	09/17/87	09/17/87	09/17/87	09/17/87
AROCLOR 1016		<1*	<1*	<1*	<1*
AROCLOR 1221		<1	<1	<1	<1
AROCLOR 1232		<1	<1	<1	<1
AROCLOR 1242		<1	<1	<1	<1
AROCLOR 1248		1110	1350	120	1800
AROCLOR 1254		<1	<1	<1	<1
AROCLOR 1260		<1	<1	<1	<1
AROCLOR 1262		<1	<1	<1	<1
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

* Micrograms per swab

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P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

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mical Analysis

Laboratory Certification Number 10120

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BLDG.12, CODE 460
CHARLESTON , SC 29408

DATE: 09/21/87

CONTACT: MR. SCOTT SCHAFER

RELEASED BY: GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB2

PAGE NO.: 1

PARAMETER	SAMPLE ID :	#148	#149	#150
	LAB ID :	87090843	87090844	87090845
	DATE RECEIVED:	09/17/87	09/17/87	09/17/87
AROCLOR 1016		<1*	<1*	<1*
AROCLOR 1221		<1	<1	<1
AROCLOR 1232		<1	<1	<1
AROCLOR 1242		<1	<1	<1
AROCLOR 1248		765	<1	<1
AROCLOR 1254		<1	<1	<1
AROCLOR 1260		<1	<1	<1
AROCLOR 1262		<1	<1	<1
EXTRACTION & CONCENTRATION		YES	YES	YES

* Micrograms per swab

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P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

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Chemical Analysis

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408
CONTACT: MR. SCOTT SCHAFER

DATE: 09/23/87

RELEASED BY: GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB2

PAGE NO.: 1

PARAMETER	SAMPLE ID :	#151	#152	#153	#154
	LAB ID :	87091012	87091013	87091014	87091015
	DATE RECEIVED:	09/21/87	09/21/87	09/21/87	09/21/87
AROCLOR 1016		<1*	<1*	<1*	<1*
AROCLOR 1221		<1	<1	<1	<1
AROCLOR 1232		<1	<1	<1	<1
AROCLOR 1242		<1	<1	<1	<1
AROCLOR 1248		3	2	2	7
AROCLOR 1254		<1	<1	<1	<1
AROCLOR 1260		<1	<1	<1	<1
AROCLOR 1262		<1	<1	<1	<1
EXTRACTION & CONCENTRATION		YES	YES	YES	YES

*Micrograms per swab

Engineering Consulting
Chemical Analysis

GENERAL ENGINEERING LABORATORIES
1313 Ashley River Road
Charleston, S.C. 29407

P.O. Box 30712
Charleston, S.C. 29417
Phone (803) 556-8171

Laboratory Certification Number 10120

CLIENT: CHARLESTON NAVAL SHIPYARD
BLDG.12, CODE 460
CHARLESTON , SC 29408

DATE: 09/23/87

CONTACT: MR. SCOTT SCHAFER

RELEASED BY: GEORGE C. GREENE PE,PHD

CC/FC: NVBA/PCB2

PAGE NO.: 1

PARAMETER	SAMPLE ID :	#155	#156
	LAB ID :	87091016	87091017
	DATE RECEIVED:	09/21/87	09/21/87
AROCLOR 1016		<1 *	<1 *
AROCLOR 1221		<1	<1
AROCLOR 1232		<1	<1
AROCLOR 1242		<1	<1
AROCLOR 1248		16	<1
AROCLOR 1254		<1	<1
AROCLOR 1260		<1	<1
AROCLOR 1262		<1	<1
EXTRACTION & CONCENTRATION		YES	YES

* Micrograms per swab

APPENDIX M

Old Plating Shop Waste Treatment Area - Analytical Data

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly T. Greene
President

George C. Greene, P.E., Ph.D.
Vice President
SC Registration No. 9103

Laboratory Certifications:

FL	E87156/87294
NC	233
SC	10120
VA	00151
NACIP	Approved

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/16/89

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/CR2

Page No.: 1

Parameter	Sample ID :	PW-1 (4') 02/06/89	PW-1 (5') 02/06/89	PW-1 (6') 02/06/89	PW-3 (4') 02/06/89
	Lab ID :	89020441	89020442	89020443	89020444
	Sample Type :	15	15	15	15
	Date Received:	02/06/89	02/06/89	02/06/89	02/06/89
	Collected by :	GEL	GEL	GEL	GEL
CHROMIUM		21.2 ppm	27.6 ppm	26.6 ppm	25.8 ppm
ACID DIGESTION		YES	YES	YES	YES

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly L. Greene
President

George L. Greene, P.E., Ph.D.
Vice President
SC Registration No. 9101

Laboratory Certifications
FL E871
SC
NC
VA 00151
Approved

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/16/89

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/CR2

Page No.: 1

Parameter	Sample ID :	PW-3 (5') 02/06/89	PW-3 (6') 02/06/89
	Lab ID :	89020445	89020446
	Sample Type :	15	15
	Date Received:	02/06/89	02/06/89
	Collected by :	GEL	GEL
CHROMIUM		3.83 ppm	8.38 ppm
ACID DIGESTION		YES	YES

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly L. Crane
President

George C. Crane, P.E., PhD
Vice President
SC Registration No. 9103

Laboratory Certifications:

EPA	TN01596/37294
SC	233
[illegible]	10120
[illegible]	00151
NACIP	Approved

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/16/89

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSAM

Page No.: 1

Parameter	Sample ID	PW-6 (4') 02/07/89	PW-6 (5') 02/07/89	PW-6 (6') 02/07/89	PW-13 (4') 02/07/89
	Lab ID	89020534	89020535	89020536	89020537
	Sample Type	15	15	15	15
	Date Received	02/08/89	02/08/89	02/08/89	02/08/89
	Collected by	GEL	GEL	GEL	GEL
CADMIUM					15.5 ppm
CHROMIUM		9.79 ppm	7.10 ppm	17.9 ppm	128 ppm
ACID DIGESTION		YES	YES	YES	YES

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly L. Greene
President

George C. Greene, P.E., Ph.D.
Vice President
SC Registration No. 9101

Laboratory Certifications:
FL
SC
SC
VA
CACTP

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/16/89

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSAM

Page No.: 1

Parameter					
	Sample ID :	PW-13 (5') 02/07/89	PW-13 (6') 02/07/89	PW-14 (4') 02/07/89	PW-14 (5') 02/07/89
	Lab ID :	89020538	89020539	89020540	89020541
	Sample Type :	15	15	15	15
	Date Received:	02/08/89	02/08/89	02/08/89	02/08/89
	Collected by :	GEL	GEL	GEL	GEL
CADMIUM		3.88 ppm	0.716 ppm	1.02 ppm	1.69 ppm
CHROMIUM		46.6 ppm	9.57 ppm		
ACID DIGESTION		YES	YES	YES	YES

GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly [illegible]
President

[illegible], P.E., Ph.D.
Vice President
SC Registration No. 9101

Laboratory Certifications:
[illegible] 231
[illegible] 10120
[illegible] 90181
[illegible] Approved

CERTIFICATE OF ANALYSIS

Client: ENVIRONMENTAL & SAFETY DESIGNS, INC
P.O. BOX 341315
MEMPHIS , TN 38184

Date: 02/16/89

Contact: MR. J. SPEAKMAN, PhD, PE

Released by: ALLAN M. CRANE

cc/fc: ENSA/ENSAM

Page No.: 1

Parameter					
Sample ID :	PW-14 (6') 02/07/89	PW-16 (4') 02/07/89	PW-16 (5') 02/07/89	PW-16 (6') 02/07/89
Lab ID :	89020542	89020543	89020544	89020545
Sample Type :	15	15	15	15
Date Received:	02/08/89	02/08/89	02/08/89	02/08/89
Collected by :	GEL	GEL	GEL	GEL
CADMIUM	0.596 ppm	3.36 ppm	2.31 ppm	1.32 ppm
ACID DIGESTION	YES	YES	YES	YES

APPENDIX N

Pressure Tested Waste Oil Line

MEMORANDUM: SEPT. 26, 1991

FROM: S. A. WASHINGTON, JR. CODE 700A

TO: LES FLYNN, KEMRON ENV.

SUBJ: WASTE OIL LINES TESTING, 1988, 89 & 90

1. LES PER OUR CONSERVATION 25 SEP 91 THE INFORMATION IS AS FOLLOWS.

(A) OCT. 13, 1988:
PRESSURE TESTED WASTE OIL LINE FROM TANK 3906-O TO, TANKS 39-A & D, 3901-A AND PIER KILO, FOR TWO (2) HOURS @ 40 PSI

(B) NOV. 7, 1989:
PRESSURE TESTED WASTE OIL LINE FROM TANK 3901-A TO, TANKS 39-A & D, 3906-O AND PIER KILO, FOR TWO (2) HOURS @ 45 PSI
PRESSURE LOSS DURING TEST 3 PSI.

(C) NOV. 8, 1990:
PRESSURE TESTED WASTE OIL LINE FROM TANK 3901-A TO, TANKS 39-A & D, 3906-O AND PIER KILO, FOR TWO (2) HOURS @ 45 PSI
PRESSURE LOSS DURING TEST 3 PSI.

S. A. Washington, Jr.

S. A. WASHINGTON, JR.
DEPUTY DIRECTOR

Post-it™ brand fax transmittal memo 7671	# of pages ▸
To LES FLYNN	From S. A. WASHINGTON
Co. KEMRON ENV.	Co. NAVAL SUPPLY CENTER
Dept.	Phone # (803) 743-6086
Fax # 404-636-7162	Fax # 803-743-1729

DEPARTMENT OF THE NAVY
NAVAL SUPPLY CENTER
CHARLESTON, SOUTH CAROLINA 29408-6300

AREA CODE 803-
743-
AUTOVON 563-

IN REPLY REFER TO:

11018
700/067
29 JUN 92

From: Commanding Officer, Naval Supply Center, Charleston, SC
To: Southern Division, Naval Facilites Engineering Command, Charleston, SC

Subj: PRESSURE TESTING WASTE OIL SYSTEM

1. Per your request the following is submitted:

(a) Thursday, November 7, 1991, pressure tested waste oil line from tank 3901-A via 3901-B pumphouse to, tanks 39A & D, 3906K, L, M, N, O, P, Chicora Tank Farm and Pier Kilo, for two (2) hours at 48 psi pressure loss during test 3 psi. (Note: Pressure loss through valves packing gland.)

(b) Thursday, June 4, 1992, pressure tested waste oil line from tank 3901-A via 3901-B pumphouse to, tanks 39A & D, 3906K, L, M, N, O, P, Chicora Tank Farm, and Pier Kilo, for two (2) hours at 60 psi pressure loss during test none. (Note: Reason for line testing before regularly scheduled test is November 1992, line develop a leak at tank 3906L located at Chicora Tank Farm. Per SOP entire waste oil system must be tested.)

BGStuart
LT B. G. Stuart
By direction

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 1
To Todd DANIEL	From S. A. Washington
Co.	Co.
Dept.	Phone #
Fax # 743-0563	Fax # 743-1129

APPENDIX P

Subcontract Laboratory QA/QC Plan

Note: Will be submitted when a laboratory is selected.

APPENDIX Q

Resumes of Key Project Personnel

HENRY H. BEIRO
SENIOR GEOLOGIST

EDUCATION: B.S., Geology, 1981
B.S., Biology, 1986

CERTIFICATION: 1989, Professional Geologist

EXPERIENCE:

- Completed a $1.5 million project at the Y-12 weapons plant in Oak Ridge, TN involving soil borings, groundwater well installation, and sampling.

- Review and writing Quality Assurance/Quality Control documents, work plans and field sampling plans for military installations in the US with Martin Marietta Energy System's Hazardous Waste Remedial Action Program (HAZWRAP).

- Designed the Tuskeegee, AL Landfill, installed monitoring wells and trained operators.

- Conducted and managed field gas chromatography for soil gas investigations, the most recent was Phelps Collins ANG, Alpena, MI in October 1991.

- Managed and supervised core drilling, rotary drilling, auger drilling and churn drilling operations at various sites.

MARK E. BOWERS, CHEMIST

EDUCATION: M.S., Environmental Pollution Control, The Pennsylvania State University/1988
B.A., Chemistry, Magna Cum Laude, University of North Carolina - Wilmington/1986

CERTIFICATION: Industrial Hygienist in Training, American Board of Industrial Hygiene

EXPERIENCE:

- Performed data validation following EPA Laboratory Data Validation Functional Guidelines for Evaluating Organics and Inorganics Analysis and EPA Precision and Accuracy Statements for alternative analytical methods.

- Developed and implemented Quality Assurance Project Plans (QAPPs) for NPL Site RI/FS in Kentucky, South Carolina and Tennessee.

- Developed QAPPs for numerous projects under EnSafe's joint venture contract with the Southern Division of the Naval Facilities Engineering Command Comprehensive Long-Term Environmental Action Navy (CLEAN) program (Maryland, Virginia, Tennessee, and Texas).

- Developed QAPPs for RCRA and State driven site investigations in Arkansas, Rhode Island and Arizona.

- Drafted Health and Safety Plans for site investigations in conjunction with an NPL site in Kentucky, and numerous hazardous materials/waste sites in Pennsylvania, Arizona, Maryland, Texas, and Tennessee.

- Assisted in the Development of Baseline and Post-Remedial Risk Assessments for NPL sites in South Carolina and Tennessee.

- Performed soil sampling at pesticide contaminated sites in Arizona, Missouri, South Carolina and Florida.

- Employed as Project Manager/Environmental Scientist conducting pre-

conveyance environmental audits, asbestos-containing materials surveys, soil and groundwater contamination investigations, supervising soil remediation projects, and preparing project proposals including budgets and schedules.

- Coordinated and supervised the closure of underground storage tank systems including 'Special Waste' disposal operations.

- Designed and conducted industrial hygiene testing programs for industrial clients in Mississippi, Arkansas, and Tennessee.

BENJAMIN J. BRANTLEY,
GEOLOGIST

EDUCATION: M.S., Geology, (Concentration in Geophysics) Memphis State/1990
B.S., Geology, Memphis State/1984

CERTIFICATION: Registered Geologist TN (#1602)

AFFILIATIONS: NGWA
American Geophysical Union

EXPERIENCE:

- Project Geologist responsible for supervision of underground storage tank closures per the Tennessee Department of Environment and Conservation's UST Division Guidelines.

- Project Geologist for preparation and implementation of Environmental Assessment Plans and Environmental Assessment Reports for Tennessee Department of Environment and Conservation, Division of UST.

- Responsible for numerous "preconveyance" Phase I environmental audits to determine potential presence of hazardous substances at sites under consideration for commercial and/or residential sale or development.

- Conducted numerous Phase II and Phase III Preliminary Contamination Assessments.

WILLIAM D. BACKUS,
GEOLOGIST

EDUCATION: B.S., Geology, Memphis State, 1985

CERTIFICATION: 1991, Registered Geologist
1991, Certified Hazardous Materials Manager

EXPERIENCE:

- Mr. Backus has a diverse background in the management, design and implementation of geophysical techniques at uncontrolled hazardous waste sites.
- Managed a $5.5 million CERCLA removal at a wood treating Superfund site.
- Performed an extensive geophysical survey at a petroleum refinery service contractor site in conjunction with Region II EPA and the Commonwealth of Puerto Rico.
- Managed a large project to develop the contingency plan for Region IV EPA's emergency response to a catastrophic earthquake along the New Madrid or Charleston Fault Zone.
- Performed numerous geophysical surveys at RCRA and CERCLA HW sites.
- Responded to many emergency spills of hazardous chemicals and wastes as a technical assistance contractor to Region IV EPA.

BARTON T. DOUGLAS,
GEOLOGIST

EDUCATION: M.S., Geology, 1990
B.S., Geology, 1986

EXPERIENCE:

- Designed and implemented a hydrologic investigation of TCE contamination in the municipal water supply of Douglas, MI.

- Conducted aquifer pumping tests and slug tests on sites in Millington, TN, Indianapolis, IN, and an NPL site in Fairfax, SC.

- Project manager for the removal and remediation of two leaking underground storage tanks at an auto maintenance facility in Memphis, TN.

- Assisted in the design and construction of a groundwater remediation system at the TCE contaminated site in Millington, TN. Tasks included placement and installation of fourteen remediation wells.

- Participated in an environmental audit of a storage facility in Memphis, TN.

- Involved in the installation and sampling of numerous groundwater monitoring wells on NPL sites in western Tennessee.

DAVID H. FELTER
REGISTERED GEOLOGIST

EDUCATION: B.S., Geology, 1983

CERTIFICATION: 1992, Registered Geologist

EXPERIENCE:

- Project geologist responsible for the implementation of an EAP and generation of the EAR for tank (t-301) at NAS Memphis.

- Geologist responsible for generation of section E - Groundwater Monitoring Program for the Part B Application for WPNSTA Yorktown.

- Project geologist/project manager for over 75 Site Inspection, Preliminary Assessment, Expanded Site Inspection, and Hazard Ranking System reports.

DAVID W. FUEHRER,
GEOLOGIST

EDUCATION: M.S., Geology, Bowling Green State University/1981
B.A., Geology, Knox College/1979

CERTIFICATION: Registered Professional Geologist TN #0679
Registered Professional Geologist AR #624

EXPERIENCE:

- Generated 19 exploration and drilling prospects in five offshore areas in the Gulf of Mexico and created five regional geologic studies in the Texas Gulf Coast Basin.

- Co-authored research and reports for the work plans on three Superfund sites in Kentucky and Tennessee.

- Completed Phase I Audits at a number of commercial and industrial sites in Tennessee and Mississippi.

- Responsible for geologic, geo-technical and hydrogeologic investigations required for permitting at a planned hazardous waste disposal facility.

- Involved in the construction and sampling of groundwater monitoring wells in eastern Tennessee.

- Conducted Phase II Audits involving drilling and sampling for seven clients in five states.

- Supervised the installation of groundwater monitoring wells and participated in the sampling of those wells at a Superfund site in western Tennessee.

- Authored one work plan and contributed to other work plans and projects for U.S. Navy "CLEAN" investigations.

GINNY L. GRAY,
GEOLOGIST

EDUCATION: B.A., Geology cum Laude Austin Peay State University/1987

CERTIFICATION: Registered Geologist, TN

EXPERIENCE:

- On the Chase Site in Doiglas, MI, Ms. Gray implemented a field sampling protocol to identify levels of PCBs and Chromium for a contractor bid package.

- Conducted land burial site investigation at Oak Ridge National Laboratory to monitor for prediction and extent of transmission of radionuclides.

- Prepared a feasibility study for Open Burning/Open Detonation Part B RCRA Permit at NAS Key West.

- Prepared a Part B RCRA Permit and a Hazardous Waste Management Plan for NAS Oceana.

- Sampled groundwater monitoring wells for hazardous substance contamination and supervised well drilling operations at Memphis, Tennessee state Superfund site.

- Conducted continuing investigation of steel mini- mill "fluff" dump in Virginia to determine the areal and vertical extent of contamination by a listed hazardous waste. This investigation included preparation of remedial action proposals and their respective feasibilities.

- Conducted preliminary assessment of DRMO storage yard at Naval Air Station Pensacola for hazardous waste contamination.

- Responsible for design and implementation of various "preconveyance" environmental audits to determine potential soil contamination at various sites being considered for commercial and/or residential development.

- Developed a Hazard Communication Program for the City of Memphis Public Works Division. These programs required compliance surveys, development of compliance manuals, as well as coordination with city officials.

- Conducted remedial investigations at facilities for sites with potential soil and/or groundwater contamination involving pesticides, chlorinated solvents, and petroleum products.

- Prepared closure plans for several hazardous waste storage yards at Naval Base Norfolk, NAS Jacksonville, and Naval Air Station Oceana.

- Field supervision and implementation of numerous underground storage tank removal investigations. Field assessments include soil sampling and/or monitoring well installation with groundwater sampling.

- Site Manager for two (CERCLA) Superfund Sites in Ohio and McLean Counties, Kentucky. Responsible for negotiations with USEPA, RI/FS implementation, budgeting, resource allocation, etc.

- Conducted sampling of drums at pesticide spill site. Responsible for selecting removal contractor and supervised off site disposal to permitted hazardous waste facility.

- Performed karst investigation at western Kentucky Superfund site to determine potential contaminant migration pathways and turbulent flow aquifer characteristics on-site.

GERALD T. HAVERKOST,
GEOLOGIST

EDUCATION: B.S., Geology, University of Kentucky, 1989

CERTIFICATION: Registered Geologist, TN 1762

EXPERIENCE:

- Site Geologist for a chlorinated solvent contaminated TN state Superfund site. Tasks included work plan design, field supervision, data reduction, and report generation.

- Site Geologist for a CERCLA RI/FS of a former pesticide formulating facility in South Carolina. Tasks included implementation of a field sampling plan, data reduction, and report generation.

- Prepared a QA/QC plan necessary for conducting soil/groundwater investigations under provisions of the Mississippi Groundwater Protection Trust Fund.

- Site Geologist for a chlorinated solvent contaminated industrial facility in Indiana. Tasks included monitoring well installations and in-situ soil gas monitoring.

- Assistant Geologist for a hydrogeologic investigation conducted on a chlorinated solvent contaminated site in Michigan. Field investigation included deep soil borings, monitoring well installations, and report generation.

- Developed and implemented closures at numerous UST sites. Tasks included conducting assessments of leaking USTs and supervision of corrective actions.

- Responsible for conducting "preconveyance" investigations to evaluate potential soil/groundwater contamination at sites being considered for commercial development.

- Served as a staff geologist for an engineering firm in Marietta, GA. Responsibilities included project management and assistance with numerous drilling projects.

CONWAY TODD HUGHES III
GEOLOGIST

EDUCATION: M.S. Geology, Memphis State University, 1982
B.S. Geology/Earth Science, Middle Tennessee State University, 1980

CERTIFICATION: Registered Geologist, Tennessee

EXPERIENCE:

- Conducted a prepurchase Phase 1 and Phase 2 environmental assessments at multiple industrial plants owned by ABB Sprout-Bauer located in the United States and Canada for Machinenfabrik Andritz Actiengesellschaft.

- State Superfund site involving contamination with various hazardous substances at the Stauffer Chemical Plant in Mt. Pleasant, TN.

- Seven years conducting geologic and hydrogeologic investigations at solid and hazardous waste sites in Tennessee. Reviewed geologic and hydrogeologic site conditions and data for siting and operational permit or closure of sanitary and industrial landfills and hazardous waste treatment storage and investigations, well installations and sampling. Prepared reports summarizing site conditions and recommending site usage.

- National Priority List involving groundwater contamination of a regional aquifer at the Carrier Plant in Collierville, TN.

- National Priority List site involving groundwater contamination with heavy metals at the Murray Ohio Site in Lawrenceburg, TN.

- State Superfund site involving groundwater contaminated with industrial solvents at the Genesco Site in Brentwood, TN.

- National Priority List site involving groundwater contaminated by pesticides at the Arlington Blending Site in Arlington, TN.

- State Superfund involving creosote contamination at the Wrigley Charcoal Plant in Lyles, TN.

- State Superfund site involving removal of PCB contaminated soil at the Modine Plant in Lawrenceburg, TN.

- State Superfund site involving groundwater contaminated with industrial solvents at the Heil-Quaker Plant in Lewisburg, TN.

- State Superfund site involving groundwater contaminated with solvents at the Sperry-Univac Site in Bristol, TN.

- Conducted preliminary site evaluations of the Newsome Station and Spicewood Hollow potential landfill sites at the Metro Nashville Landfill sighting.

- Conducted various activities including preliminary and final geologic and hydrogeologic assessments of potential landfill sites including soil classification and segregation, monitoring well installation, monitoring system evaluation for numerous counties, municipalities, industries and commercial landfills in Middle Tennessee.

LYNN S. HURLEY,
GEOLOGIST

EDUCATION: B.S., Geology cum Laude, Memphis State University/1982

CONTINUING EDUCATION:
NGWA—Principles of Groundwater
Remediation Technologies, Inc.—Bioremediation of Hazardous Waste
Executive Enterprises, Inc.—Environmental Regulations Course

CERTIFICATION: Registered Geologist, TN (#1332)

EXPERIENCE:

- Responsible for design and implementation of various "preconveyance" environmental audits to determine potential presence of hazardous substances at sites under consideration for commercial and/or residential sale or development.

- Conducted Contract Laboratory Protocol level groundwater sampling of monitoring wells for TCE contamination and supervised well drilling connected with RI/FS investigations at an NPL site.

- Project Geologist for remedial investigations at facilities for sites with potential soil and/or groundwater contamination involving pesticides, chlorinated solvents, and petroleum products.

- Project Geologist responsible for field supervision and implementation of underground storage tank removal investigations. Field assessments included soil sampling and/or monitoring well installation with groundwater sampling.

- Responsible for preparation of Environmental Assessment Plans and Corrective Action Plans for the Tennessee Department of Environment and Conservation, Division of Underground Storage Tanks, following remedial investigations.

- Served in an oversight capacity for all field activities associated with remedial investigations involving the removal of numerous underground petroleum and hazardous substance storage tanks.

- Responsible for design, preparation and implementation of a sampling plan for Tennessee landfill containing hazardous substances.

- Site Geologist for Site Inspections at two Naval facilities in New Orleans, Louisiana under the U.S. Navy "CLEAN" contract. Responsible for preparation, coordination, implementation, and oversight of all field activities including geophysical surveys, soil and groundwater sampling, well installation, and material disposal. Authored Site Inspection Reports for both facilities.

- Served in an oversight capacity during remediation and sampling of chlordane contaminated soils in Tucson, Arizona. Responsible for coordination of on-site personnel with state officials and contractors, and coordination of all field activities.

- Familiar with RCRA and CERCLA guidelines as they pertain to field investigation and report preparation.

ANDREW C. KIM
CHEMIST

EDUCATION: B.S. Chemistry, Rutgers University/1989

A.S. Engineering Science, Bergen Community College/1985

TRAINING: OSHA 40 Hour Health and Safety Training

EXPERIENCE:

- Developed and implemented Quality Assurance Project Plans (QAPPs) and performed the role of Quality Assurance/Quality Control (QA/QC) Project Manager for a number of projects under the Ensafe/Allen & Hoshall CLEAN program with the Southern Division of the Naval Facilities Engineering Command Comprehensive Long-Term Environmental Action Navy program. The QA/QC Manager is responsible for overseeing the project quality assurance aspects of the data under the U.S. EPA CONTRACT LABORATORY PROGRAM and under the NAVY ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY (NEESA).

- Knowledgeable in the field of technical analytical data evaluation, review and validation under the EPA Contract Laboratory Program, Standard Operating Procedures.

- Received approximately two years experience with Buckman Laboratory, Inc. as Quality Control Chemist dealing with analytical instrumentation and with quality control measures.

- Four years of analytical experiences with methodologies and instrumentations, such as GC/FID & PID, GC/ECD, HPLCs, UV/IR Spectroscopy, and various wet chemistry methodologies.

JOSEPH R. MATTHEWS, GEOLOGIST

EDUCATION: M.S., Geology, Memphis State University/1989
B.S., Geology, University of Tennessee at Chattanooga/1985

CERTIFICATION: Registered Professional Geologist TN1112

EXPERIENCE:

- **Project Manager/Geologist** developed RCRA Facility Investigations and directed field operations at Naval facilities. Investigated shallow subsurface and shallow aquifer systems to define contaminant migratory pathways and evaluate health risks. Data used to determine the proper worker protection for the demolition of a pesticide-contaminated storage facility.

- **Project Manager** developed and implemented UST closures in compliance with local, state and federal (RCRA) laws and regulations. Conducted assessments of leaking UST sites and completed corrective actions for petroleum hydrocarbon contaminated soil and groundwater systems. Completed UST- related projects in Tennessee, Mississippi, Missouri, Alabama, Indiana, Texas, and Kentucky.

- **Project Geologist** designed and directed field activities of a Site Inspection of a land disposal facility for the US Navy. Prepared a Site Inspection report under CERCLA protocol for the preparation of a Hazard Ranking Score of the facility.

- **Project Geologist** conducted state and private industry site investigations: assessing geohydrologic conditions, determined nature and extent of site contamination, dealt with organo-pesticides, chlorinated hydrocarbons, non-halogenated hydrocarbons, chlorides, cyanides and PCB's.

- **Project Coordinator** overseeing the emergency remedial response action at a PCB spill site in Akron, Ohio. Activities included removal of PCB-contaminated soils, oil-cooled capacitors containing PCB dielectric fluids and decontamination of PCB contaminated concrete floors and walls. Designed and implemented sampling scheme for verification of cleanup of PCB contaminated areas.

- **Geologist** supervised drilling operations, installed monitoring wells, monitored health and safety compliance, and collected soil and groundwater samples following CLP protocol.

- **Geologist** investigating a proposed hazardous waste incinerator site: characterized stratigraphy, geologic structure and geohydrologic conditions.

- **Assistant Geologist** for a long-term groundwater monitoring program at a Tennessee State Superfund site: quarterly groundwater sampling under CLP protocol, collected and reduced groundwater data and prepared piezometric maps and geologic cross-section delineating the distribution of a chlorinated hydrocarbon plume in a multiple aquifer system.

- **Investigator** conducting Phase I environmental site assessments and environmental compliance audits consistent with the "due diligence" clause of CERCLA. Reviewed facility operation for compliance with local, state and federal environmental laws and regulations. Identified potential environmental compliance problems and estimated cost for corrective action. Conducted audits in close cooperation with investors, legal counsel, and lending institutions and their attorneys. Designed and conducted Phase II audit investigations where subsurface and groundwater contamination was indicated.

- **Field Coordinator** on hazardous materials abatement sites: monitoring health and safety compliance and consulting.

GREG T. PIERCE, GEOLOGIST

EDUCATION: B.S. Western Kentucky University/1991

EXPERIENCE:

- Co-authored RCRA Facility Investigation Plan (RFI) and Verification Investigation Plan (VI) for the Naval Explosive Ordnance Disposal Technical Center (NEODTC), Stump Neck Annex, Indian Head, Maryland. The project dealt with the investigation of contaminated soils, surface water and groundwater. The contaminates of concern are 40 CFR 264 Appendix IX metals, semi-volatiles, volatiles and explosive compounds, such as RDX, HMX, and TNT.

- Authored a groundwater monitoring program for an industrial site in Memphis, Tennessee. The contaminates of concern are trichloroethene, tetrachloroethylene, cyanide, and metals.

- Performed an investigation of macropores and their contribution to sinkhole collapse and contaminant migration in karst terrain.

- Versed in groundwater computer modeling.

- Performed microgravity survey for the detection of cave passages.

- Assisted in dye traces for the delineation of drainage basins.

- Assisted in the installation of monitoring wells, and piezometers for a groundwater remedial investigation.

- Assisted in the quarterly sampling of over 40 monitoring wells under CLP protocol at a Tennessee Stated Superfund site.

- Assisted in conducting Phase I environmental compliance audits.

- Assisted in conducting Phase II audit investigations to determine surface and groundwater contamination.

- Assisted in the quarterly groundwater sampling under CLP protocol at a pesticide processing facility in Fairfax, South Carolina. The contaminants of concern are semi-volatiles, volatiles, metals, and organo-pesticides.

SCOTT RYAN
GEOLOGIST

EDUCATION: M.S., Geology, 1986
B.S., Geology, 1982

EXPERIENCE:

- Project consultant for a field investigation for groundwater exploration in the Kalahari Desert, Gaborone, Botswana, Africa. His responsibilities included surveying, drilling supervision, and coordination with Bostwanan authorities.

- Groundwater protection regulatory analysis with the Connecticut Department of Environmental protection. Responsibilities included technical review and enforcement at hazardous waste sites and sanitary landfills.

- Multiple language skills including Spanish and Mandarin Chinese (verbal skills).

- Experience in RCRA groundwater protection standards and implementation of those standards in an industrial context.

JAMES N. SPEAKMAN, Ph.D., P.E.
VICE PRESIDENT; ENGINEERING

EDUCATION: Ph.D., Environmental and Water Resources Engineering, Vanderbilt University/1971
M.S., Sanitary Engineering, Vanderbilt University/1968
B.S., Civil Engineering, Tennessee Technological University/1966

EXPERIENCE:

- Program Manager for Southern Division Naval Facilities Engineering Command Comprehensive Long-term Environmental Action, Navy (CLEAN) District II environmental services contract. The CLEAN District II contract encompasses DOD implementation of CERCLA; compliance with RCRA; underground storage tank program implementation; asbestos abatement; oil and hazardous substance spill contingency planning; and spill response management. The program has a 10-year duration and a $100 million maximum budget.

- Manager of Remedial Investigation/Feasibility Study (RI/FS) projects at National Priorities List (NPL) sites in Olaton and Island, KY. Each site is being investigated for potential air, surface water, soil and groundwater releases of ammonia, metals, sulfides, ammonia and chlorides.

- Directed numerous environmental compliance projects involving multi-disciplinary teams. He has managed six open-end hazardous waste compliance contracts for the U.S. Navy, involving more than 40 installations in eight states, Puerto Rico, Bermuda and Iceland. Those contracts included preparation of facility closure plans; sampling, analysis and data interpretation; negotiating "how clean is clean" with regulatory officials; closure plans and specifications and closure certifications.

- Performed audits of air emissions, industrial discharges, hazardous wastes, underground storage tanks and hazard communication programs for steel mills, aluminum mills and recycling plants, auto parts fabricators, concrete plants, aggregate mines, plastic formulation plants, forges and wood milling plants.

- Directed underground tank assessment/closure/ removal/remediation projects involving benzene, acetone, toluene, naptha, and petroleum fuels at Santa Ana, CA; Charleston, SC; Lawrenceburg and Memphis, TN; Dallas, TX, and Yorktown, VA. Projects involved removal of as many as six (6) tanks concurrently.

- Author and certifying engineer for numerous oil spill prevention, control and countermeasures plans, including US Navy installations in KY, OH, MS, TN, VA, Bermuda, Iceland and Puerto Rico.

- Certifying engineer of record for closure of hazardous waste facilities, including container storage, treatment and storage tanks and surface impoundments in FL, GA, SC and TN. Prepared RCRA closure plans for additional facility types, including landfills, land treatment units and "miscellaneous units" (specifically military ordnance open burning/open detonation units).

- Manager of PCB spill investigation, Work/Sampling/Health and Safety Plan preparation, negotiations with TN Department of Health and Environment, and supervision of remediation.

- Site manager, field investigation, immediate removal, groundwater monitoring at inactive HW Lagoon, Western MI.

- Author of Feasibility Study Work Plan for American Creosote Works NPL site in Jackson, TN.

- Supervised preparation of engineering plans and specifications for closure of hazardous waste surface impoundments at NAS Jacksonville (2 units), and NAS Pensacola (3 units) and MCLB Albany, GA. Closure-in-place designs included various cap configurations, meeting or exceeding USEPA impermeability requirements, while providing for subsequent beneficial use of the surfaces.

- Directed RCRA permanent status permit applications for the Lake City (Independence, MO), Holston (Kingsport, TN) and Milan, TN Army Ammunition Plants. Those facilities operate multiple hazardous waste storage and treatment facilities, i.e. container storage buildings, surface impoundments, waste piles, incinerators, and treatment units; handling corrosive, reactive (including explosive), ignitable and toxic hazardous wastes.

PAUL V. STODDARD, P.G., VICE PRESIDENT, GEOLOGICAL SERVICES

EDUCATION: M.S., Geology, Memphis State University/1983
B.S., Geology, Memphis State University/1982
B.S., Biology, Memphis State University/1980

CERTIFICATION: Professional Geologist, TN, AR
Pending Certification, IN

EXPERIENCE:

- Generated stratigraphic correlations of upper Cretaceous and Tertiary trends of South Texas with concentration in the Wilcox and Frio formations. Responsible for regional correlations of E-logs, preparation of stratigraphic cross sections, development and updating of structure maps, and well spotting and digitizing.

- Conducted remedial site investigations at facilities for sites with potential soil and/or groundwater contamination involving chlorinated hydrocarbons and petroleum products. Field assessments included in-situ monitoring of organic vapors utilizing an organic vapor detector and/or a scanning infrared spectrophotometer.

- Responsible for the design and implementation of "preconveyance" investigations to determine potential soil contamination at various sites being considered for commercial development.

- Field supervision and implementation of closure plans for hazardous waste facilities at Charleston, SC Naval Shipyard. Tasks included removal of hazardous waste inventories, decontamination of tanks, confirmation sampling of decontamination solutions and soil sampling at container storage compounds operated by the Shipyard and Defense Reutilization and Marketing Office.

- Sampled groundwater monitoring wells for hazardous substance contamination and supervised well drillers at Shelby County, TN state Superfund site.

- Conducted a study of pesticide contamination in groundwater at an industrial facility in Missouri. Field Investigation included soil boring, monitoring well installation, determination of hydraulic gradients, data reduction and analyses, and report generation.

- Implemented groundwater investigation for photosensitive hazardous substance contamination at NPL site.

- Field supervision and implementation of closure plans for removal of underground waste oil storage tanks and investigation of potential contamination in soils and groundwater from tank releases.

- Field supervision and implementation of sampling plan for hazardous waste facilities at NAS Memphis. Task included Level B inspection of former waste plating treatment storm sewer, and the sampling of soils associated with defective joints. The task also included the sampling of a former salvage yard for petroleum hydrocarbons and lead.

- Field supervision and implementation of underground storage tank removal investigations. Field assessments include soil sampling and/or monitoring well installation with groundwater sampling and assessment of hydrogeologic conditions.

- Project geologist for interior survey of 120 acre underground room and pillar mine. Additional tasks included surface investigation of karst features, monitoring well installation, interpretation of borehole geophysics, and subsequent groundwater sampling and data reduction.

- Project geologist for hydrogeologic assessment of RCRA facilities. Tasks include site selection and installation of groundwater monitoring networks, slug tests, and subsequent data evaluation.

- Project geologist for MCAS Cherry Point, RFI. Tasks included design and implementation of Field Sampling Plan, including soil borings, monitoring well installation, groundwater sampling, slug tests, hydrogeologic characterization -- including diurnal and tidal influences on the shallow aquifer and subsequent data reduction and report generation.

- Project geologist for hydrogeologic assessment of a proposed TN state Superfund site. Investigation included step drawdown and constant rate aquifer pump test for design and installation of a groundwater treatment system.

- Project manager for CERCLA Remedial Investigation/Feasibility Study for a former pesticide manufacturing facility. Tasks included the design and implementation of geologic/hydrogeologic assessment for volatile organic and pesticide contamination, subsequent data reduction, and report generation. Project management included cost tracking, scheduling, and continued regulatory compliance (i.e. Administrative Order).

- Project manager for CERCLA RI/FS for an industrial manufacturing facility. Related tasks included the design and implementation of geologic/hydrogeologic assessments for chlorinated solvent contamination in soils and groundwater. Investigation included monitor well installations, soil vapor extraction, borehole and surface geophysics, and a constant rate aquifer pump test, with subsequent data reduction and interpretation and RI report generation. Project management duties included community relations, maintaining data quality objectives, scheduling, waste disposal, and meeting Administrative Order Requirements.

- Supervised and directed remedial investigations (RI) per CERCLA requirements at multiple NPL sites, Region 3, Region 4, Region 5 and Region 6. Investigations included, but were not limited to, soil analyses, monitor and recovery well installation, sampling and analyses of groundwater, aquifer tests, borehole geophysics, surface geophysics and data interpretation, including preparation and presentation of assessment reports.

APPENDIX R

Well Casing Material

Source: US Army Corps of Engineers. Leaching of metal pollutants from four well casings used for groundwater monitoring. September 1989.

Hewett, Alan D. Groundwater Monitoring Well Review. Potential of Common Well Casing Materials to Influence Aqueous Metal Concentrations. Spring, 1992.

Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) is committed to using only the most reliable methods to obtain the data used in its investigations. Therefore, SOUTHNAVFACENGCOM recommends the use of well casings made of Polyvinyl chloride (PVC) material for monitoring wells installed at NAS Cecil Field. After reviewing the literature, SOUTHNAVFACENGCOM has concluded that PVC is a superior well casing material when monitoring a plume consisting of both metals and organics. Attached are two recent publication supportive of SOUTHNAVFACENGCOM's position: "Influence of Casing Materials on Trace-Level Chemicals in Well Water" (Parker, 1990) and "Leaching of metal pollutants from four well casing used for ground-water monitoring" (Hewitt, 1989).

SOUTHNAVFACENGCOM requests USEPA consider the following information as required in the "Alternate Well Casing Material Justification" form.

1. The Data Quality Objectives (DQO) for the samples to be collected from wells with PVC casing per EPA/540/G-87/003., "Data Quality Objectives for Remedial Response Activities."

Response: The DQOs for the remedial investigation (RI) at Cecil Field are to provide information of sufficient quality to support risk assessment and feasibility study conclusions. The quality assurance and quality control (QA/QC) procedures are specified in the Sampling and Analysis Plan (SAP). Sample collection and accompanying QA/QC procedures are designed to meet USEPA level 4 criteria.

2. The anticipated compounds and their concentration range.

Response: The following is a list of the contaminants that exceeded an existing maximum contaminant level (MCL) and the highest contaminant concentration detected: Lead at 385 ug/l, Chromium at 425 ug/l, benzene at 4 ug/l, Trichlorethylene at 400 ug/l, and 1,1-Dichloroethane at 210 ug/l.

3. The anticipated residence time of the sample in the well and the aquifer's productivity.

Response: Each well will be purged immediately before the sample is collected. The anticipated residence time of the water prior to sampling should be less than twenty minutes. The surficial aquifer is estimated to have a transmissivity range of 0.05 to 3.93 m^2/day.

4. The reason for not using a hybrid well.

Response: SOUTHNAVFACENGCOM feels that PVC is the preferred material when sampling mixed waste plumes. Stainless steel may absorb or adsorb heavy metals such as lead, chromium and arsenic. Also, the cutting oils used in the manufacturing of stainless-steel riser and screen are difficult to remove. These oils, if not completely removed by the decontamination cleaning, may contaminate the well. Hybrid wells introduce additional problems, such as, the junction is usually a weak point subject to breakage or is a place for down-hole equipment to become ensnared.

5. Literature on adsorption/desorption characteristics of the compounds and elements of interest for the type of PVC to be used.

Response: Two reprints are attached that evaluate the sorptive characteristics of stainless steel and PVC. The study tilted "Influence of Casing Materials on Trace-level Chemicals in Well Water" (Parker, 1990), evaluated all the chemicals of concern identified in previous Cecil Field studies except benzene and 1,1-dichloroethane.

6. If an anticipated increase in thickness of the wall thickness will require a larger annular space.

Response: No change in the annular space is required.

7. The type of PVC to be used and if available the manufacturers specifications. And an assurance that the PVC to be used does not leach, mask, react or otherwise interfere with the contaminants being monitored within the limits of the DQO(s).

Response: The PVC will comply with American Society of Testing and Materials (ASTM) F480 and D1785.

SOUTHNAVFACENGCOM strongly believes that the quality of data obtained by using PVC well construction materials will be equal to or an improvement over the use of stainless steel as a general purpose well construction material.

DEPARTMENT OF THE ARMY
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY, CORPS OF ENGINEERS
HANOVER, NEW HAMPSHIRE 03755-1290
February 25, 1991

Applied Research Branch

Ms. Peggy Lane
ABB Environmental Services
2571 Executive Center Circle, East
Suite 100
Tallahassee, Florida 32301

Dear Ms. Lane:

I have enclosed a copy of our journal article that compares the sorption of organics and metals by four well casing materials (PVC, PFTE, and stainless steel types 304 and 316). I have also included a more recent study that compares the leaching of metals from these materials; this study was conducted by Alan Hewitt. It is our opinion that since you are monitoring for both VOC's and metals that PVC is the best material to use in your monitoring wells, provided that you do not anticipate encountering an undiluted solvent of PVC. Stainless steel is not a good casing material to use when monitoring for metals. Also, stainless steel should not be placed in any environment that is corrosive. "The Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells," by Linda Aller et al. (1989, published by the National Water Well Association, Dublin, Ohio) has an excellent discussion on corrosion of steel products.

If you would like any additional questions answered, please do not hesitate to call me at 603-646-4393. Alan Hewitt can answer any questions on our metals studies. He can be reached at 603-646-4388.

25 FEB 91 2:19

I hope you find this material useful.

Sincerely,

Louise Parker

Louise V. Parker
Research Physical Scientist
Applied Research Branch

2 enclosures

Special Report 89-32

September 1989

US Army Corps
of Engineers
Cold Regions Research &
Engineering Laboratory

Leaching of metal pollutants from four well casings used for ground-water monitoring

Alan D. Hewitt

Prepared for
U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
REPORT CETHA-TE-CR-89186

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Leaching of Metal Pollutants From Four Well Casings Used for Ground-Water Monitoring

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Polytetrafluoroethylene (PTFE), polyvinylchloride (PVC), stainless steel 304 (SS 304) and stainless steel 316 (SS 316) well casings were tested for suitability for ground-water monitoring. A laboratory experiment, testing for the leaching of Ag, As, Ba, Cd, Cr, Hg, Pb, Se and Cu, was run in triplicate by exposing sections of the well casings to ground water for four periods ranging from 1 to 40 days. The results showed that PTFE did not leach any of the nine analytes studied, while SS 316 and PVC showed significant leaching of Cr, Cd and Pb; SS 316 also leached significant amounts of Ba and Cu. Stainless steel 304 showed significant leaching of Cr and Pb. In every case where contamination was observed, the release of metal analyte, when averaged over all of the exposure periods, was the greatest from either SS 304 or SS 316. Released contaminants were sorbed back onto the well casings in several cases.

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22a. NAME OF RESPONSIBLE INDIVIDUAL Alan D. Hewitt	22b. TELEPHONE (Include Area Code) 603-646-4100	22c. OFFICE SYMBOL CECRL-RC

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PREFACE

This report was prepared by Alan D. Hewitt, Research Chemist, Geochemical Sciences Branch, Research Division, U.S. Army Cold Regions and Research and Engineering Laboratory. This project was funded by the U.S. Army Toxic and Hazardous Materials Agency (R-90 Multi-analytical Services), Martin H. Stutz, project monitor.

The author thanks Dr. Thomas F. Jenkins and Dr. Clarence Grant for assistance in the experimental design, and Dr. Charles M. Reynolds, James H. Cragin, Dr. Jenkins, Dr. Iskandar K. Iskandar and Dr. Grant for critical reviews of the text.

The contents of this report are not to be used for advertising or promotional purposes. Citation of brand names does not constitute an official endorsement or approval of the use of such commercial products.

CONTENTS

	Page
Abstract	i
Preface	ii
Introduction	1
Materials and methods	2
Materials	2
Test design	2
Analysis	3
Results	5
Barium	5
Cadmium	5
Chromium	5
Lead	5
Copper	7
Arsenic, mercury, selenium and silver	7
Discussion	7
Conclusion	9
Literature cited	9
Appendix A: Levels of Cd, Pb, Cr, Ba and Cu determined in ground-water solutions	11

ILLUSTRATIONS

Figure

1. Ground-water leaching of metals from well casings being examined .. 7

TABLES

Table

1. Recovery of Cd, Cr and Pb from ground water stored in the sample jars and allowed to equilibrate before being acidified with concentrated HNO_3 3
2. EPA interim primary drinking water quality levels and the method detection limits 3
3. Summary of ANOVA and LSD determinations for average analyte concentrations 4
4. Physical state of stainless steel pipes after exposure to ground water .. 8
5. Average metal concentrations for the controls based on the groups established by the Cu populations 8
6. Summary of results 9

Leaching of Metal Pollutants From Four Well Casings Used for Ground-water Monitoring

ALAN D. HEWITT

INTRODUCTION

Ground-water monitoring requires the installation of conduits to transfer water to the surface for collection. Four commonly used well casings are made from 2-in. (5-cm) diameter polyvinylchloride (PVC), stainless steel 304 (SS 304), stainless steel 316 (SS 316) and polytetrafluoroethylene (PTFE) pipes. Representative sampling of ground water requires that materials employed in the saturated zone do not influence the concentration of analytes of interest.

Only a few studies have reported the influence of well-casing materials on the concentrations of inorganic substances in ground water during water quality analyses. Several studies have demonstrated that these materials (stainless steel, PVC and PTFE) sorb appreciable quantities of certain ionic species (Eichholz et al. 1965, Miller 1982, Hewitt 1989). Evidence also exists showing that metals are released into ground water from stainless steel and PVC pipes (Houghton and Berger 1984, Barcelona and Helfrich 1986, Hewitt 1989). The release of metal analytes by stainless steel has been associated with its corrosion, which in some instances has been observed to produce a hydrous iron precipitate (Barcelona and Helfrich 1986, Hewitt 1989).

Recently, a laboratory experiment was conducted testing the effects of ground-water composition on the well casings cited above (Hewitt 1989). In this experiment two concentrations of metals (As, Cd, Cr and Pb), pH and total organic carbon were introduced as ground-water solution variables. Results of this experiment indicated that PTFE was inert to the variables, whereas both PVC and stainless steel well casings were affected. These two materials leached and sorbed some of the metals introduced into the ground water. In addition, several stainless steel casing sections developed surface oxidation, which introduced a random source of variation by providing release mechanisms and active sites for sorption. PVC was a low-level source for Cd and provided sorption sites for Pb. Stainless steel 316 was a low-level source for Cd and provided sorption sites for As, Cr and Pb. Stainless steel 304 was also a low-level source for Cd and provided sorption sites for As and Pb. The extent of the sorption or release of metals was often influenced by the solution variables. This study concluded that the stainless steel casings were the least suitable for monitoring the metals studied (As, Cd, Cr and Pb) in the ground water solutions.

A concurrent study done at CRREL (Parker et al. 1989) looked at ground-water solutions spiked with organic compounds exposed to the same four well casings. In contrast to the results for metals, eight (cis and trans-1,2-dichloroethylene, m-nitrotoluene, trichloroethylene, chlorobenzene, o-,p- and m-dichlorobenzene) of the ten organic compounds studied sorbed more quickly and to a greater extent onto PTFE than PVC and did not sorb onto the stainless steels. The same results were obtained when the ground water was treated with 2.0 g NaCl/L to test for effects of ionic strength. These findings support the earlier work of Reynolds and Gillham (1985) who observed rapid sorption of tetrachloroethylene by PTFE well casing. They suggested that PTFE is the least desirable material for a well casing when organic compounds are monitored in ground water.

The results of these two recent CRREL studies (Hewitt 1989, Parker et al. 1989) and supporting evidence in the literature led to the suggestion that PVC may be the best compromise among these four well casings for monitoring ground water for both inorganic and organic analytes (Parker et al. 1988).

The objective of this study is to examine metal leaching characteristics of these four well-casing materials in ground water. Leaching studies that

compare these four well casings have not been reported in the literature. The results of this experiment will determine which casings are the most or the least susceptible to leaching the metals. The analytes analyzed included all of the metals on the Environmental Protection Agency's priority pollutant list, along with copper.

MATERIALS AND METHODS

Materials

The PVC and stainless steel well casings were obtained from Johnson Well Screen, and the PTFE was obtained from MIP, Inc. All well casings were specifically manufactured for ground-water monitoring. The casings all had approximately a 5-cm inner-wall diameter and were cut in lengths of approximately 2 cm. The exact length of the rings depended on the wall thickness and diameter of the pipe because we wanted to maintain a constant surface area of 80 cm^2. Cut surfaces composed 17% of the area for the PTFE and PVC well casings and 9% for the stainless steels.

Precautions were taken during pipe milling to prevent exposure to grease, dirt, oil and solvents, and to avoid excessive handling. After milling, the individual well-casing rings were rinsed with deionized water (Millipore, Type 1) and air dried before being placed into the ground-water-filled sample containers. During rinsing we made no attempt to remove surface discoloration or ink on the pipes; we used them as we had received them from the manufacturer. This limited cleaning was consistent with commonly employed field protocols.* The well-casing sections were handled with plastic gloves and nylon forceps after milling. Two sections of the SS 316 pipe were not used because excessive surface rust had formed. In general the stainless steel well casings appeared to have developed more rust during the 9-month storage period than they had when first obtained. All experimental work was performed in class 100 cleanrooms.

Polypropylene jars (69 mm od × 62 mm height, 125 mL, Model 6185-E37, Thomas Scientific) served as the sample containers. The jars were soaked in a 10% v/v concentrated, redistilled HNO_3 (G. Fredrick Smith [GFS]) deionized water solution, then rinsed with and soaked for several days in deionized water prior to use. Other materials, such as the 7.5-mL sample aliquot bottles (polyethylene, Nagle), pipette tips (Eppendorf), and the 2-L glass bottles (reagent grade HNO_3 bottles, Baker), were cleaned similarly.

Test design

Tests for the release of metals from PVC, PTFE, SS 304 and SS 316 well casings were done in triplicate by exposing sections of each to ground water for periods of 1, 5, 20 and 40 days. Three sample containers with no well casings served as controls for each of the exposure periods. The containers with and without well casings were filled with 98 mL of ground water collected from a 76-m-deep domestic well system in Weatherfield, Vermont; 60 containers, 12 with a single section of each of the four well-casing candidates (12×4) and 12 controls, made up the experimental sample setup. The well-casing rings were submerged in the ground-water-filled sample containers creating a pipe-surface-area-to-aqueous-volume ratio of 0.82 cm^2/cm^3. This experimental design provides a surface-area-to-solution ratio similar to that of well casings in ground-water monitoring wells below the saturated zone; however, the ratio is much lower than that which exists for well screens.

Samples were prepared by transferring weighed amounts of ground water into each jar from a single 2-L glass bottle. The jars were selected randomly for the experiment because the ground water was transported in three separate 2-L glass bottles. The pH and conductivity of the ground water from all of the bottles was 7.8 and 2.40×10^{-2} mho/cm, respectively. Ground water collected from this source previously showed similar pH and conductivity levels (Hewitt 1989). While the well casings were exposed to the ground water, the jars were sealed with a cap and stored in the dark at 24°C. After the well-casing sections had been removed from the jars at the end of each time interval, 2 mL of concentrated HNO_3 (GFS) was added to the ground water to bring the pH below 1.0. Studies have shown that acidification below pH 1.5 is effective in preventing the loss of trace metals from natural waters (Subramanian et al. 1978). The acidified, ground-water-filled jars were recapped, hand-swirled for 10 seconds, then left at rest for at least 72 hours before we transferred a 5-mL aliquot to a 7.5-mL sample vial (polyethylene, Nagle) for the subsequent determination of Ag, As, Ba, Cd, Cu, Cr, Pb and Se.

The entire experimental setup was duplicated for the analysis of Hg, except that we determined Hg immediately after the ground-water-filled jar was acidified.

In a preliminary experiment, ground water stored in the polypropylene jars was spiked with

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*Personal communication with Louise V. Parker, CRREL, 1989.

Cd, Cr and Pb to see if sorption of metals ions on the jar walls would interfere with the test results. These metal ions, added to the ground water and stored for 6 days in the sample jars, were recovered upon acidification (Table 1). The desorption of metal ions from container walls has been reported by Choa et al. (1968). For this preliminary test, 5.00 µg/L of Cd, Cr and Pb was allowed to sit in ground-water-filled jars (100 mL) for 6 days. Then we added 2 mL of concentrated HNO_3 (GFS), hand swirled the solution for 10 seconds, and removed a 5-mL aliquot. A second 5-mL aliquot was removed 72 hours later, following the same procedure. The results in Table 1 show that an average of 95% of the aqueous metal was recovered immediately after acidification, and aliquots removed 3 days later showed only 2% (not significant at the 95% confidence level) additional analyte recovery. Thus the metals either remained in the laboratory ground-water solution or were desorbed from the jar walls quickly upon acidification.

Table 1. Recovery of Cd, Cr and Pb (4.90 µg/L) from ground water stored in the sample jars and allowed to equilibrate for 6 days before being acidified with 2 mL of concentrated HNO_3.

	Acidification period			
	Less than 10 minutes		*72 hours*	
	Amount ~~*added*~~ *(µg/L)*	*Percent recovered*	*Amount* ~~*added*~~ *(µg/L)*	*Percent recovered*
Cd	4.65	94.9	4.72	96.3
	4.72	96.3	4.85	99.0
Cr	4.48	91.4	4.58	93.5
	4.48	91.4	4.69	95.7
Pb	4.93	100.2	4.72	96.3
	4.72	96.3	5.01	102.2
Average recovery	95.1%		97.2%	

* determined

Analysis

Silver, arsenic, barium, cadmium, copper, chromium and lead were determined by Graphite Furnace Atomic Absorption (GFAA) using a Perkin-Elmer (PE) model 403 Atomic Absorption Spectrophotometer (AAS) coupled with a PE model 2200 heated graphite atomizer. Instrumental procedures followed the general guidelines provided in the manufacturer's instrument manual (Perkin-Elmer 1981). Hand injections of either 20, 50 or 100 µL were employed for the analytes mentioned above. For the determination of Se, a matrix modifier—0.015 mg Pd and 0.01 mg $Mg(NO_3)_2$—was added so that the charring temperature could be raised to 1200°C. Of this group, only As and Se determinations required deuterium background correction.

Mercury was determined by Cold Vapor Atomic Absorption (CVAA). We employed a 48-mL aliquot for the Hg determinations, following a modified Hatch and Ott (1968) procedure. Aliquots of 48 mL of ground water were reduced with 2 mL of 10% v/v stannous chloride and then sparged with Hg-free air. The reduced Hg vapor passed through a $Mg(ClO_4)_2$ water vapor trap into an optical cell designed to enhance detection (Tuncel and Atoman 1980). The optical cell was positioned in the light path of the PE model 403 AAS.

Mercury was determined the same day that well casings were removed from ground-water-filled jars to limit volatilization of Hg from solution (Coyne and Collins 1972, Lo and Wai 1975) and to avoid vapor contamination associated with storage in poly containers (Cragin 1979). All of the other metals were determined within 2 weeks after the last exposure period.

Analysis procedures were designed to achieve detection limits of 1% or less of the present domestic water quality levels set by the EPA (Table 2). Selenium, determined by graphite furnace, was the only metal with a detection limit slightly above this level (Table 2). Method Detection Limits (MDLs) were established following the procedure outlined in the Federal Register (1984) for the analysis of a sample in a given solution. The MDL estimate requires that a minimum of seven replicate determinations be made of an analyte concentration that is one to five times the estimated detection level.

Table 2. EPA interim primary drinking water quality levels (1983) and the method detection limits (MDL).

Metal	*EPA primary drinking water levels (µg/L)*	*MDL (µg/L)*
Ar	50	0.48
Ba	1000	2.4
Cd	10	0.059
Cu	1000	4.3
Cr	50	0.16
Pb	50	0.11
Hg	2.0	0.010
Se	10	0.21
Ag	50	0.12

Table 3. Summary of ANOVA and LSD determinations for average analyte concentrations (μg/L). Materials with common underlining are not different at the 95% confidence level as determined by the LSD.

Days	Well casing					
a. Barium						
1	Control	PTFE	PVC	SS304	SS316	(LSD = 1.4)
	4.5	6.0	6.6	7.1	7.7	
5	PTFE	Control	PVC	SS304	SS316	(LSD = 2.1)
	5.3	5.8	6.6	7.8	9.9	
20	PTFE	Control	PVC	SS304	SS316	(LSD = 2.2)
	5.5	5.9	6.1	7.4	11.3	
40	PTFE	PVC	Control	SS304	SS316	(LSD = 2.0)
	5.2	5.6	5.9	7.0	10.1	
b. Chromium						
1	Control	PTFE	PVC	SS304	SS316	(LSD = 9.76)
	0.20	0.22	1.23	1.60	6.06	
5	Control	PTFE	PVC	SS316	SS304	(LSD = 0.31)
	0.20	0.22	1.12	1.79	3.34	
20	PTFE	Control	PVC	SS316	SS304	(LSD = 1.17)
	0.19	0.22	1.20	3.30	4.61	
40	Control	PTFE	PVC	SS316	SS304	(LSD = 1.04)
	0.21	0.21	1.11	2.53	5.13	

Days	Well casing					
c. Lead						
1	Control	PTFE	SS316	SS304	PVC	(LSD = 1.45)
	0.16	0.35	0.90	1.14	2.46	
5	Control	PTFE	SS316	SS304	PVC	(LSD = 1.53)
	0.21	0.27	1.27	1.56	2.23	
20	Control	PTFE	SS316	PVC	SS304	(LSD = 2.80)
	0.14	0.35	1.00	1.04	2.86	
40	PTFE	Control	PVC	SS316	SS304	(LSD = 1.52)
	0.21	0.33	0.78	1.26	2.06	
d. Copper						
1	PVC	SS304	Control	PTFE	SS316	(LSD = 12.0)
	9.4	10.7	11.9	12.1	35.8	
5	PTFE	PVC	Control	SS304	SS316	(LSD = 12.4)
	7.8	9.9	10.1	11.0	42.6	
20	PVC	PTFE	Control	SS304	SS316	(LSD = 38.5)
	6.8	8.3	10.1	26.1	81.2	
40	PVC	PTFE	SS304	Control	SS316	(LSD = 17.2)
	4.4	5.2	11.5	14.0	82.3	

The MDL is obtained by multiplying the standard deviation of the replicate measurements by the appropriate one-sided *t*-statistic corresponding to $n-1$ degrees of freedom at the 99% confidence level.

Each sample aliquot with a determined analyte concentration above the MDL was analyzed at least twice. Analyte concentrations were based on the average peak heights from a strip chart recording.

Aqueous calibration standards for Ag, As, Cd, Cr, Cu, Pb, Hg and Se were prepared by diluting 1000-mg/L certified atomic absorption stock solutions (Fisher Scientific Corp.). A Ba stock standard was made by dissolving a weighed amount of $Ba(NO_3)_2$ (Baker, Reagent Grade) in deionized water. Working standards were prepared in deionized water acidified to 2% v/v with HNO_3 (GFS).

Calibrations were established by determining three different concentration standards in triplicate. Standards were randomly introduced throughout the course of sample analysis, and all of the calibration curves were linear over the concentration range examined. To see if the intercepts were significantly different from zero, we compared the residuals for the models with an intercept and for the models with zero intercept using the *F*-ratio at the 95% confidence level. Analyte concentrations in the samples and controls were determined based on the slope and intercept only if the intercept was deemed significant. Otherwise, a zero-intercept linear model was employed.

To assess leaching of metals from the surfaces of the four well-casing materials, an analysis of variance (ANOVA) was performed on those metals (Ba, Cr, Cu and Pb) that had been consistently found above the established MDL for the four well-casing materials and the control. If a significant

difference was detected by the ANOVA among the average analyte concentrations in the ground water for a given material, then a Least-Significant-Difference (LSD) analysis was performed. Both analyses (ANOVA and LSD) used the 95% confidence level. The results of these analyses established which well casings contributed particular analytes to the ground water over and above those contributed by other well casings or the control for the different exposure periods (Table 3). In addition the aqueous metal concentrations that exceed 1% of the EPA drinking water quality level were identified. This low-level warning criterion was chosen since this study did not always establish the native levels present in the ground water. Thus, the contribution of metals from the well casings could range from one or more orders of magnitude above the background concentrations.

RESULTS

Barium

The analysis of the 1-day exposure samples showed that all of the ground-water-filled vessels containing pipe sections had aqueous Ba concentrations that were significantly greater than that of the control; however, all of the values were low (Table 3a). The subsequent exposure periods do not follow this pattern but instead established that SS 316 was the only material that consistently contributed significant levels of Ba to the solution relative to the other samples and the controls (Fig. 1a). The average increase in aqueous concentration for the ground water exposed to SS 316 was about 70% compared to the control. After 5 days of exposure, ground water in contact with SS 316 developed aqueous Ba concentrations that exceeded 1% of the drinking water quality level established by the EPA. None of the other well casings tested produced aqueous Ba concentrations that exceeded 1% of the EPA drinking water quality criterion or were significantly different from the control after the initial exposure period.

Cadmium

We did not use ANOVA with Cd since the majority of concentrations determined were below the MDL (Appendix A). After 1 day of exposure, both ground-water solutions containing SS 316 and PVC had aqueous Cd that exceeded 1% of the EPA drinking water quality level.

Figure 1b shows the average Cd concentrations determined for the control and well casings. It appears that Cd is initially released from SS 316 and PVC but becomes resorbed onto the well casing with time. Stainless steel 316 contributes approximately an order of magnitude (more than 10% of the EPA drinking water quality level in some cases) more Cd than PVC for equivalent exposure periods.

Chromium

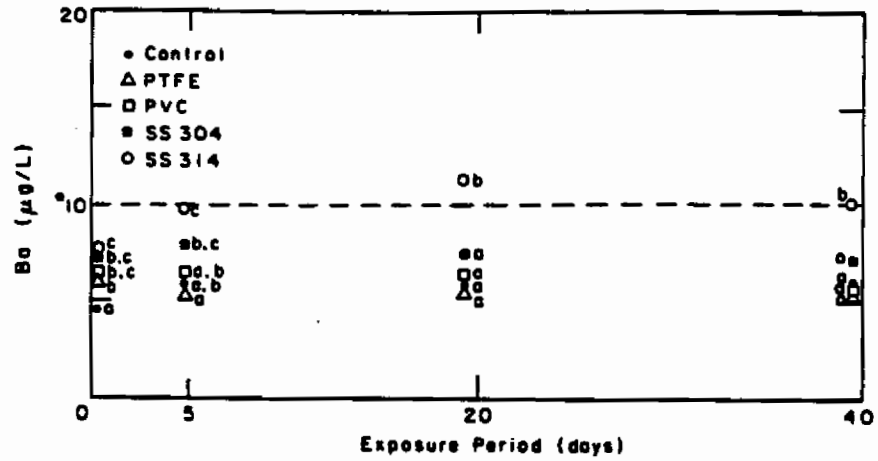
Beyond the 1-day exposure, the analysis consistently demonstrated that both stainless steel well casings contributed significantly greater quantities of Cr to the ground water than the control or the other materials tested (Table 3b). These metal well casings, along with PVC, increased Cr concentrations in the ground water above 1% of the EPA drinking water quality level (Fig. 1c). The extent of the Cr contamination coming from the PVC was three to five times less than that coming from the SS 304, which usually showed the highest average contamination for a given exposure period, the exception being the initial exposure period.

The ANOVA and LSD tests failed to distinguish any difference between the materials for the 1-day exposure because of the large variation among the the three SS 316 samples. If SS 316 is removed, the analysis shows both PVC and SS 304 to contribute significantly greater quantities of Cr to the ground water than do the control and PTFE. The only material that showed a consistent trend was SS 304 (Fig. 1c), which created increasing concentrations of Cr with time. Throughout the experiment there was no significant difference for Cr between the control and the PTFE well casing.

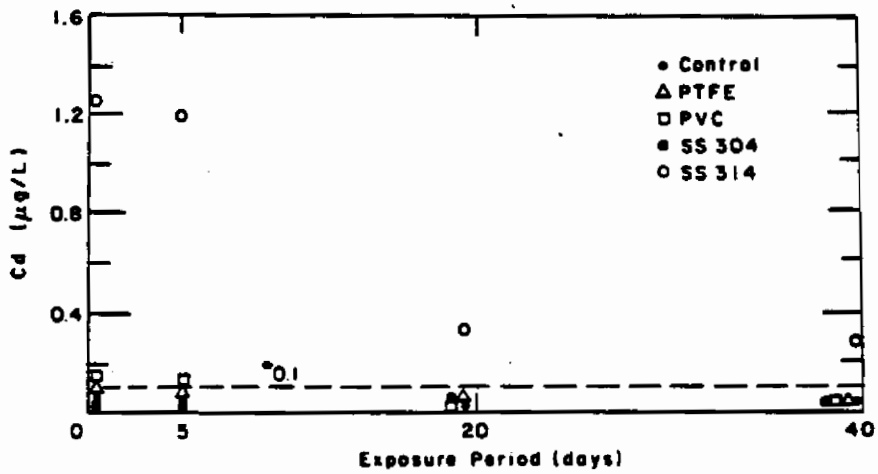
Lead

The first two exposure periods showed PVC to leach the greatest amount of Pb and to be significantly different from the control and PTFE. The two longest exposure periods showed that SS 304 leached the greatest amount of Pb to ground water; however, the levels observed in solution for SS 304 were only statistically different from the rest for the 40-day exposure period (Table 3c). The average levels obtained for both of the stainless steels and for PVC consistently exceeded 1% of the EPA drinking water quality standard (Fig. 1d).

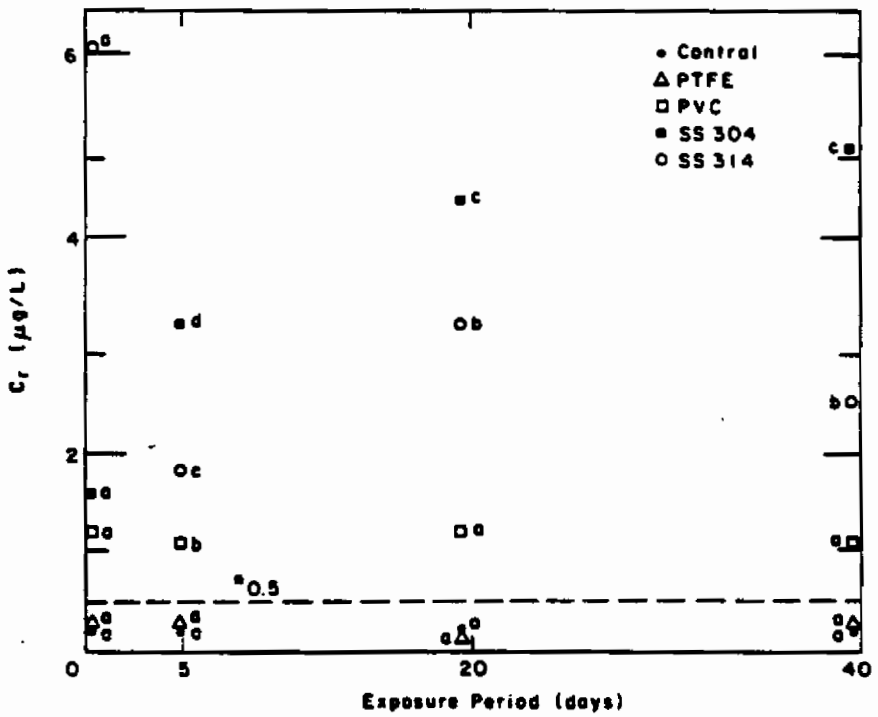
The most distinctive trend was the decrease in Pb with increasing time of exposure for PVC (Fig. 1d). Both stainless steel well casings showed slight decreases in Pb levels after aqueous concentration maxima were obtained. The Pb that was initially released was resorbed by the PVC and stainless steel well casings. Throughout the experiment, there was no significant difference among the control, SS 316 and PTFE.



a. Ba.

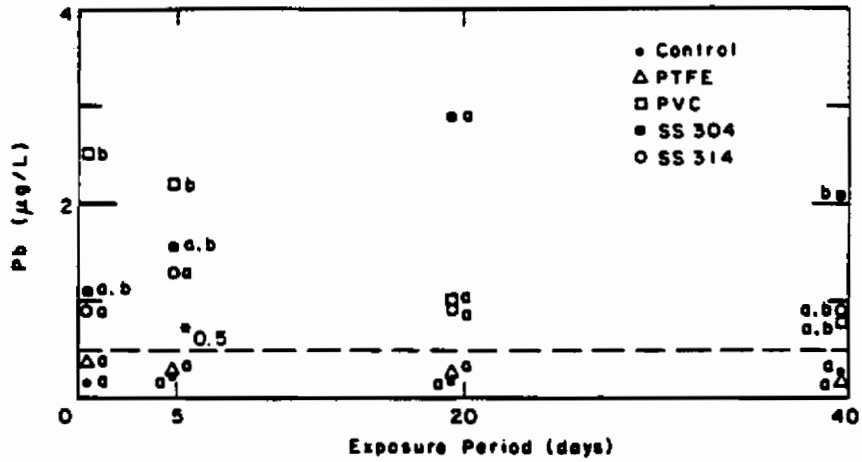


b. Cd.

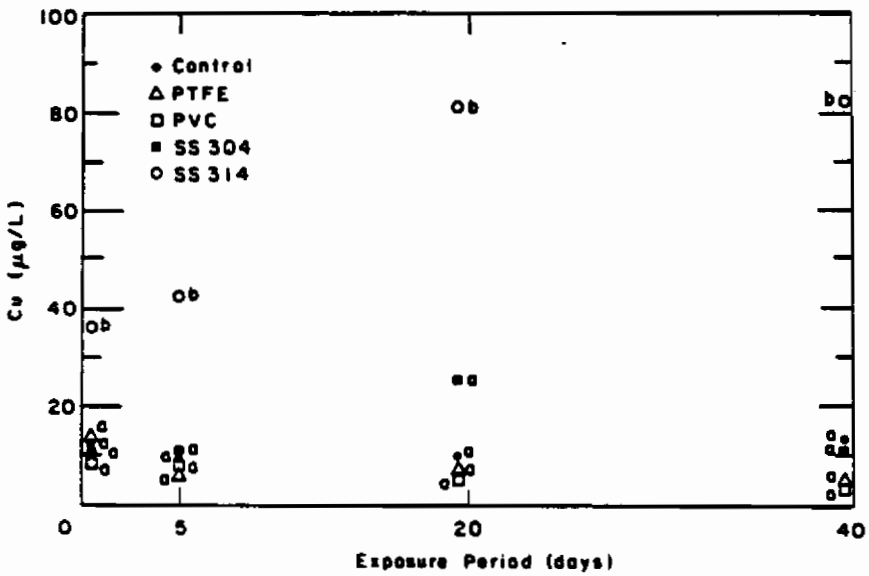


c. Cr.

Figure 1. Ground-water leaching of metals from well casings being examined. Common letters next to points denote no significant difference at the 0.05% confidence interval as determined by ANOVA and LSD.



d. Pb.



e. Cu.

Figure 1 (cont'd).

Copper

The statistical analysis distinguished SS 316 as the only material that contributed significantly more Cu when exposed to ground water than the other materials tested (Table 3d). Aqueous concentrations exceeded 80 µg/L for SS 316 versus about 10 µg/L for the other materials and the control.

Both PTFE and PVC well casing showed a general trend of decreasing Cu with increasing time of exposure and often showed concentrations below the control (Fig 1e). This trend, along with the lack of any trend with respect to the control, demonstrates that these two plastic pipes provided the substrate for sorption.

Arsenic, mercury, selenium and silver

The determinations for As, Hg, Se and Ag were not statistically analyzed because the majority of the concentrations were at or below the established MDLs. Based on the analysis methods employed, none of the well casings consistently contributed As, Hg or Ag above 1% or Se above 2% of the EPA drinking water quality level.

DISCUSSION

Ground water was collected from a domestic well system and stored in sealed 2-L glass bottles

for approximately 24 hours prior to being transferred into test jars. Ground water collected in this fashion is aerated at the faucet and exposed to an oxygen-rich environment every time the lid of the container is removed. Handling the ground water in this manner most likely changed the oxidation potential, facilitating oxidation reactions (Stumm and Morgan 1970). We made no attempt to simulate the natural ground-water redox state or to quantitatively assess the chemical equilibria that existed during the course of this experiment.

There was visible rust on 11 of 24 sections of the stainless steel pipes (Table 4). Each pipe section was carefully examined prior to submersion and after removal from the ground water. In this experiment and in a previous one (Hewitt 1989), oxidation on the stainless steel was predominantly found on the wall. If oxidation is providing sites for sorption or release mechanisms, then the freshly cut surfaces were most likely not a major factor in the behavior of these two materials. Fresh surfaces on the PVC pipe is not an experimental artifact since PVC well screen is made by slotting the pipe.

It was apparent from the values determined for the control samples that the three 2-L glass bottles used to transport the ground water had different concentrations of aqueous Cu (Appendix A). The range of aqueous Cu concentrations most likely reflect the residence time of the ground water in the household and well plumbing. Three distinct populations of Cu concentration were determined for the controls at the 99% confidence level (X_1 = 9.8±0.0, n = 4; X_2 = 10.3±0.22, n = 5; X_3 = 16.0±0.0, n = 3). Differences between adjacent mean concentrations were established by testing against the maximum variance determined for all of populations (i.e., X_1X_2 and X_2X_3).

The groups established by the three Cu populations were then tested to determine if any of the other metals found above its MDL were also significantly different. Table 5 presents the averages and standard deviations for the metal groups based on the Cu populations for the controls. Only Pb shows the same increasing mean concentration trend as the Cu groupings; however, the averages for the adjacent Pb groups were not significantly different at the 95% or even the 80% confidence level when analyzed in the same manner as the Cu populations. This analysis establishes that only Cu was significantly influenced by the sample preparation procedure. Mixing the ground water from the three collection bottles would have eliminated

Table 4. Physical state of stainless steel pipes after exposure to ground water.

	Section											
	1	2	3	4	5	6	7	8	9	10	11	12
SS 304	WR	WR	—	—	WR	—	WR	WR	ER	WR	WR	WR
SS 316	—	—	—	—	ER	—	—	—	—	—	—	ER

KEY: WR = rust on wall; ER = rust on edge; dash means no rust.

Table 5. Average metal concentrations for the controls based on the groups established by the Cu populations (µg/L).

Populations		*Cu*	*Cr*	*Pb*	*As*	*Ba*
1	Avg.	9.8*	0.22	0.11	0.55	5.2
	Std. Dev.	0.0	0.021	0.00	0.114	0.92
2	Avg.	10.3*	0.20	0.25	0.48	5.8
	Std. Dev.	0.19	0.032	0.154	0.00	0.29
3	Avg.	16.0*	0.22	0.28	0.48	5.6
	Std. Dev.	0.0	0.021	0.048	0.00	0.75

* Statistically different at the 99% confidence level.

Table 6. Summary of results.

	Ba	*Cd*	*Cr*	*Pb*	*Cu*
Materials that leached >1% of the EPA drinking water quality level in ground-water solutions.	SS 316 PVC	SS 316 PVC	SS 304 SS 316 PVC	SS 304 PVC SS 316	NA*
Material that showed the highest average overall amount of analyte leached	SS 316	SS 316	SS 304	SS 304	SS 316

* Does not apply.

this artifact. The level of Cu leached from the SS 316 far exceeded the difference between the established populations.

The results of this study support our previous work (Hewitt 1989) showing that PTFE is the least reactive material, whereas both PVC and stainless steel well casings influence aqueous concentrations of metals in laboratory ground-water solutions. As in the first study, the variance among the stainless steel replicates was often the greatest, indicating that this material is susceptible to producing random error. Both studies found that SS 316 and PVC leach and sorb Cd; in addition, these two materials, along with SS 304, sorb Pb. Studies in the future should be conducted under anoxic conditions to see if oxidation of the stainless steel is simply an artifact of these experiments. If corrosion of stainless steel is absent under reducing conditions, then we might expect less random variation and less of an influence on the metal analytes in ground-water solutions.

A summary of the results (Table 6) clearly shows that the stainless steels were the greatest sources of contamination under these experimental conditions. When PVC leached metals (Pb, Cr and Cd) that exceeded 1% of the EPA drinking water quality specifications into solution, there was always a trend showing a decrease in concentration with time of exposure. This would suggest that the leaching of Pb, Cr and Cd from PVC is a surface process and is small. Most likely the initial release could be decreased by more extensive cleaning before the pipes are used. The same statement does not apply to the stainless steel well casings. In the cases of leached Cu from SS 316 and leached Cr from SS 304, the concentrations of these metals continually increased with time over 40 days. It is possible that stainless steels could supply these analytes to ground water over an extended period of time, perhaps the entire life of the casing.

CONCLUSION

Among the four types of well casings tested, PTFE was the only material that did not leach any of the nine metals examined. The other materials tested in this experiment (PVC, SS 304 and SS 316) compromised laboratory ground-water samples by contributing analytes of interest (Ba, Cd, Cr, Pb and Cu). Investigations where only trace metals are of interest should use PTFE below the saturated zone. PVC would be the appropriate second choice since its influence on metal analytes appears predictable and small. In contrast, the two stainless steel materials should be avoided.

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APPENDIX A: LEVELS OF CD, PB, CR, BA AND CU DETERMINED IN GROUND-WATER SOLUTIONS (~~MG~~ µg/L).

Pipe	Replicate	Time (days)	Number	Cd	Pb	Cr	Ba	Cu
Cntrl	1	1	1	< D*	0.11	0.21	4.2	9.8
Cntrl	2	1	2	< D	0.11	0.19	4.6	9.8
Cntrl	3	1	3	< D	0.26	0.21	4.8	16.0
Cntrl	1	5	4	< D	0.40	0.15	5.5	10.5
Cntrl	2	5	5	< D	0.11	0.24	5.8	9.8
Cntrl	3	5	6	< D	0.11	0.20	6.1	10.1
Cntrl	1	20	7	< D	0.11	0.24	6.1	10.1
Cntrl	2	20	8	< D	0.11	0.22	6.1	9.8
Cntrl	3	20	9	< D	0.19	0.20	5.5	10.5
Cntrl	1	40	10	< D	0.42	0.20	5.8	10.1
Cntrl	2	40	11	< D	0.24	0.20	5.7	16.0
Cntrl	3	40	12	< D	0.33	0.24	6.3	16.0
PTFE	1	1	1	< D	0.40	0.19	5.9	10.8
PTFE	2	1	2	< D	0.26	0.28	6.1	9.8
PTFE	3	1	3	< D	0.40	0.19	5.9	15.7
PTFE	1	5	4	0.117	0.40	0.24	4.9	9.1
PTFE	2	5	5	< D	0.30	0.21	5.5	8.4
PTFE	3	5	6	< D	0.11	0.21	5.5	5.9
PTFE	1	20	7	0.117	0.40	0.21	5.8	15.3
PTFE	2	20	8	< D	0.30	0.16	5.2	4.9
PTFE	3	20	9	< D	0.36	0.19	5.5	4.6
PTFE	1	40	10	< D	0.11	0.21	4.9	4.3
PTFE	2	40	11	< D	0.11	0.16	5.5	7.0
PTFE	3	40	12	< D	0.40	0.26	5.2	4.3
PVC	1	1	1	0.109	2.19	1.13	6.7	9.4
PVC	2	1	2	0.125	3.09	1.40	7.0	9.8
PVC	3	1	3	0.175	2.11	1.15	6.1	9.1
PVC	1	5	4	0.075	2.39	1.15	7.3	8.0
PVC	2	5	5	0.142	2.43	1.30	6.4	13.2
PVC	3	5	6	0.109	1.87	0.91	6.1	8.4
PVC	1	20	7	< D	2.11	1.30	6.4	11.9
PVC	2	20	8	< D	0.66	1.40	5.8	4.3
PVC	3	20	9	< D	0.34	0.91	6.1	4.3
PVC	1	40	10	< D	0.93	1.08	6.1	4.3
PVC	2	40	11	< D	0.75	1.03	5.2	4.3
PVC	3	40	12	< D	0.66	1.22	5.5	4.6
SS 304	1	1	1	< D	0.48	1.22	6.7	9.8
SS 304	2	1	2	< D	0.88	1.13	7.0	13.2
SS 304	3	1	3	< D	2.05	2.45	7.6	9.1
SS 304	1	5	4	< D	1.25	3.33	7.3	9.8
SS 304	2	5	5	< D	0.96	3.21	8.2	8.0
SS 304	3	5	6	< D	2.47	3.48	7.9	15.3
SS 304	1	20	7	0.092	0.80	4.36	7.3	9.1
SS 304	2	20	8	< D	2.81	3.87	7.6	49.7
SS 304	3	20	9	< D	4.98	5.59	7.3	19.6
SS 304	1	40	10	< D	2.97	5.10	6.7	9.1
SS 304	2	40	11	< D	1.47	4.56	6.4	9.4
SS 304	3	40	12	< D	1.73	5.73	7.9	15.9
SS 316	1	1	1	2.629	0.41	1.48	7.0	27.5
SS 316	2	1	2	0.209	0.60	1.29	7.3	35.5
SS 316	3	1	3	0.926	1.70	15.36	8.7	44.5
SS 316	1	5	4	0.217	0.96	1.81	8.5	37.2
SS 316	2	5	5	2.930	2.30	1.69	11.5	37.6
SS 316	3	5	6	0.451	0.55	1.86	9.6	52.9
SS 316	1	20	7	0.326	1.50	3.45	12.3	102.2
SS 316	2	20	8	0.376	0.76	2.96	9.3	56.7
SS 316	3	20	9	0.326	0.75	3.50	12.3	84.8
SS 316	1	40	10	0.267	0.67	3.18	11.5	97.3
SS 316	2	40	11	0.384	0.75	1.94	9.0	77.2
SS 316	3	40	12	0.209	2.36	2.45	9.8	72.3

* Less than MDL

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Influence of Casing Materials on Trace-Level Chemicals in Well Water

by Louise V. Parker, Alan D. Hewitt, and Thomas F. Jenkins

Abstract

Four well casing materials — polyvinyl chloride (PVC), polytetrafluoroethylene (PTFE), and stainless steel 304 (SS 304) and 316 (SS 316) — were examined to determine their suitability for monitoring inorganic and organic constituents in well water.

The inorganic study used a factorial design to test the effect of concentration of mixed metals (arsenic [As], chromium [Cr], lead [Pb], and cadmium [Cd]), pH, and organic carbon. Sample times were 0.5, 4, 8, 24, and 72 hours. Except for slow loss of Pb, PTFE well casings had no significant effect on the concentration of metals in solution. For the other casings, changes in analyte concentration often exceeded 10 percent in eight hours or less and, thus, could bias analyses of samples taken from wells constructed with these materials. Specifically, PVC casings sorbed Pb and leached Cd; SS 316 casings sorbed As and Pb and leached Cd; and SS 304 casings sorbed As, Cr, and Pb and leached Cd. Both stainless steel casing materials showed markedly poorer performance than the PVC casings.

The well casings were also tested for sorption/desorption of 10 organic substances from the following classes: chlorinated alkenes, chlorinated aromatics, nitroaromatics and nitramines. Sample times were 0, 1, 8, 24, and 72 hours, seven days, and six weeks. There were no detectable losses of analytes in any of the sample solutions containing stainless steel well casings. Significant loss of some analytes was observed in sample solutions containing plastic casings, although losses were always more rapid with the PTFE casings than with PVC. Chlorinated organic substances were lost most rapidly. For samples containing PTFE casings, losses of some of these compounds were rapid enough (>10 percent in eight hours) to be of concern for ground water monitoring. Losses of hydrophobic organic constituents in samples containing PTFE casings were correlated with the compound's octanol/water partition coefficient.

Introduction

The U.S. Environmental Protection Agency's (EPA's) RCRA Ground Water Monitoring Technical Enforcement Guidance Document (TEGD) (U.S. EPA 1986a) states that only fluorocarbon resins or stainless steel (SS) casings should be used for monitoring volatile organics in the saturated zone. The original draft of this document (U.S. EPA 1985) suggested that Teflon® or stainless steel 304 be used for all ground water monitoring at RCRA sites. The EPA was concerned that many of the casing materials used for ground water monitoring could either affect the quality of the ground water or did not have the long-term structural characteristics required of RCRA monitoring wells. With respect to the EPA's first concern, a review of the literature published prior to 1986 did not reveal substantial evidence to support the position taken by the EPA in either edition of this document (Parker et al. 1989).

Few studies have specifically addressed the possible interactions between well casing materials and metal species. There is considerable evidence, however, that sorption of metals by plastic and glass containers can be significant (Eicholz et al. 1965, Robertson 1968, Batley and Gardner 1977, and Masse et al. 1981). In one study of PVC well casings, there was negligible loss of chromium but large losses of lead from a deionized water solution (Miller 1982). Other studies with Pyrex glass and polyethylene also found that lead was the most rapidly lost analyte (Shendrikar et al. 1976). Barcelona and Helfrich (1986) compared the concentrations of several metal species in samples taken from adjacent PVC, PTFE, and SS wells. They found increased levels of iron in water samples from the non-purged SS well to be the only statistically significant difference. In a previous in situ study by Houghton and Berger (1984), a steel-cased well appeared to leach a number of metal species, including iron, cadmium, chromium, copper, manganese, molybdenum, selenium, and zinc, when compared with a PVC well and one constructed of acrylonitrile-butadiene-styrene (ABS).

Sorption of organic solutes by well casing materials has been reported in several publications. Miller (1982) tested PVC well casing for sorption of trace levels (2-14 ppb) of six halogenated organic compounds (bromo-

form, trichlorofluoromethane, trichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and tetrachloroethylene) in aqueous solution and found slow losses of tetrachloroethylene (25-50 percent in six weeks).

Reynolds and Gillham (1986) tested both PVC and PTFE materials for sorption of trace levels (ppb) of five halogenated organics. They found rapid sorption of tetrachloroethylene by PTFE, slow sorption of 1,1,1-trichloroethane, 1,1,2,2-tetrachloroethane and hexachloroethane, and no sorption of bromoform. They also found slow sorption of all the analytes except trichloroethane by PVC. While 50 percent of the tetrachloroethylene was sorbed by the PVC in five weeks, the same amount was sorbed by PTFE in only eight hours. They attributed loss of these organics to absorption and developed a model where uptake of the compound proceeds by sorption/dissolution into the polymer surface, followed by diffusion into the polymer matrix. However, Reynolds and Gilham (1986) could not predict which organic chemicals were most susceptible to absorption.

Sykes et al. (1986) compared sorption of several organics by PVC, SS, and PTFE well casings. The casing materials were equilibrated for seven days (5 C) in analyte solution, placed in fresh analyte solution, and then tested for losses due to sorption after one and 24 hours. After 24 hours they did not find any significant losses for any of the casing materials.

While these studies indicate that sorption of some organics may be a significant problem for plastic casings over the long term, only the study by Miller (1982) examined desorption during the first two weeks. In that study, he observed some desorption (25 percent) of the tetrachloroethylene that had been previously sorbed by the PVC casings.

Casing materials may also leach a variety of organic substances. In two studies (Miller 1982, Parker and Jenkins 1986), analytical interferences in leachates from PVC well casings were sought but none were found. Curran and Tomson (1983) also examined the leachates from five plastics, including PVC and PTFE. They found that PTFE leached the fewest contaminants and that non-glued PVC was a close second. While it is possible that organic substances such as lubricants used during manufacture or inks from printing could leach from stainless or plastic casings, no information currently available in the literature confirms this.

It is interesting to note that despite the literature that is available regarding sorption of organics by PTFE, articles have recently been published that claim it is superior for sampling organic substances (e.g., Bryden and Smith 1989).

The purpose of the studies conducted by the authors was to determine the suitability of four well casing materials (PVC, PTFE, SS304, and SS316) for monitoring inorganic and organic solutes in ground water. To do this, two separate studies were conducted, one for inorganics and one for organics.

General Comments on the Inorganic and Organic Studies

Two-inch (inner) diameter well casings manufactured specifically for ground water monitoring were used in all studies. These casings were purchased specifically for the studies and were stored in a cool, dry room prior to use. Precautions were taken while the casings were being cut to prevent contamination from grease, dirt, oil, solvents, and excessive handling. The ground water used in the studies was obtained from a domestic well (249 feet [76m] deep) in Weathersfield, Vermont. No attempt was made to maintain the native dissolved oxygen level. As a general guideline for evaluating our results, we considered any change in concentration (relative to the control samples) of 10 percent in an eight-hour period to be the maximum change tolerable.

Inorganic Study

Experimental

Mixed metal solutions were prepared by spiking ground water with arsenic (As), cadmium (Cd), chromium (Cr) and lead (Pb) at two concentrations: 50 and 100 μg/L (ppb) for As, Cr, and Pb, and 10 and 2 μg/L for Cd. The higher concentrations are the current maximum concentration limits set by the EPA for drinking water (U.S. EPA 1986b). Prior to treatment, the ground water used in this study was analyzed and found to contain no detectable amounts of any of these metals at the sensitivity levels used for analysis. To simulate a wider range of ground water conditions, the tests were run at the natural pH (7.8) of the well water plus a lower pH (5.8) and at two levels of organic carbon. HCl (reagent grade) was added to lower the pH and 5 mg/L (ppm) of humic acid was added to raise the organic carbon content. A complete (2^3) factorial experiment was used to test the effect of these treatments (concentration of metals, pH and organic carbon content) (Table 1).

Because the wall thicknesses varied between the plastic and the two stainless steel casings, the casings

TABLE 1
Matrix Design for Inorganic Study

Test Condition	Metal Concentrations[1]	pH	Organic Carbon Added[2]
1	high	7.8	no
2	high	7.8	yes
3	high	5.8	no
4	high	5.8	yes
5	low	7.8	no
6	low	7.8	yes
7	low	5.8	no
8	low	5.8	yes

[1] High metal concentrations were 50 μg/L As, Cr, Pb, and 10 μg/L Cd. Low metal concentrations were 10 μg/L As, Cr, Pb, and 2 μg/L Cd.
[2] 5 mg/L humic acid was added as a source of organic carbon.

were cut to different lengths so that the surface area of each was constant (80 cm^2). Cut sections were rinsed with deionized water and air-dried before use. Individual well casings were then placed in 125mL polypropylene jars containing 100mL of test solution; the ratio of casing surface area to aqueous volume was 0.82 cm^2/mL. Similar jars that contained the test solutions without any casings were used for control samples. The sample vessels were covered, stored at 24 C and kept from natural light. Duplicates were run for each combination of variables and each casing material.

Sample aliquots (2.5mL) were taken from each container after 0.5, 4, 8, 24, and 72 hours. The aliquots were placed in clean 7.5mL polyethylene vials and acidified to a pH of less than 1 with nitric acid to prevent sorption by the containers. Metal concentrations were obtained by graphite furnace atomic absorption spectroscopy (Perkin-Elmer, model 703 atomic absorption spectrophotometer coupled with a PE model 2200 heated graphite atomizer). The concentrations of metals given in this study were measured as total.

The metal concentrations were normalized by dividing the values obtained for sample solutions that contained well casings by the values found for equivalent controls. This allowed the results for both concentrations to be analyzed by a single analysis of variance (ANOVA). Thus, it was possible to simultaneously test for the effect of solute concentration, pH and organic carbon at each sample time for each casing material. If a casing exerted no influence on analyte concentration, the expected value would be 1.00. An increase in the ratio indicates that the well casing released metal into the solution, while a decrease in the ratio indicates that metal was sorbed by the casing.

Results and Discussions

Approximately half of the stainless steel casings showed signs of surface rust. In some cases (SS 316 at a low pH), sufficient oxidation occurred to form a hydrous iron oxide precipitate. This precipitate was never observed in the control samples or those with PVC or PTFE casings. While the authors realize that rusting of the stainless casings is very condition-specific, the test conditions should be generally representative of shallow wells. Also, it was noticed that the casings had rusted some during storage prior to any testing.

Table 2 gives the normalized mean values and standard deviations for each analyte, well casing and time.

TABLE 2
Normalized Mean Metal Values[1] for Samples as a Function of Time

		Arsenic		Cadmium		Chromium		Lead	
Time (hr)	Pipe	Mean Value	Standard Deviation	Mean Value	Standard Deviation	Mean Value	Standard Deviation	Mean Value	Standard Deviation
0.5	PVC	0.991 ±	0.038	1.01 ±	0.025	1.01 ±	0.018	0.999 ±	0.009
	PTFE	0.999 ±	0.050	1.01 ±	0.011	1.01 ±	0.007	1.00 ±	0.026
	SS304	0.997 ±	0.057	1.06 ±	0.036	1.01 ±	0.016	1.02 ±	0.008
	SS316	0.994 ±	0.040	1.04 ±	0.021	1.02 ±	0.015	1.01 ±	0.025
4.0	PVC	1.02 ±	0.045	1.13 ±	0.037	0.999 ±	0.013	0.889 ±	0.030
	PTFE	0.993 ±	0.052	1.03 ±	0.054	1.01 ±	0.011	0.974 ±	0.019
	SS304	0.978 ±	0.063	1.17 ±	0.15	0.957 ±	0.037	0.784 ±	0.035
	SS316	0.945 ±	0.060	1.24 ±	0.49	0.921 ±	0.052	0.803 ±	0.077
8.0	PVC	1.00 ±	0.045	1.15 ±	0.037	1.00 ±	0.014	0.893 ±	0.035
	PTFE	1.01 ±	0.098	1.03 ±	0.016	0.989 ±	0.019	0.985 ±	0.032
	SS304	0.962 ±	0.057	1.16 ±	0.14	0.972 ±	0.16	0.699 ±	0.031
	SS316	0.945 ±	0.068	1.30 ±	0.47	0.872 ±	0.10	0.804 ±	0.10
24.0	PVC	0.994 ±	0.064	1.16 ±	0.056	1.00 ±	0.016	0.808 ±	0.051
	PTFE	0.992 ±	0.054	1.03 ±	0.017	1.01 ±	0.024	0.951 ±	0.040
	SS304	0.894 ±	0.051	1.12 ±	0.12	1.03 ±	0.37	0.538 ±	0.042
	SS316	0.853 ±	0.080	1.36 ±	0.68	0.855 ±	0.11	0.793 ±	0.19
72.0	PVC	1.03 ±	0.046	1.14 ±	0.049	1.01 ±	0.018	0.743 ±	0.064
	PTFE	1.02 ±	0.045	1.02 ±	0.022	1.00 ±	0.013	0.899 ±	0.034
	SS304	0.891 ±	0.084	1.03 ±	0.14	1.03 ±	0.42	0.452 ±	0.061
	SS316	0.874 ±	0.083	1.25 ±	0.66	0.836 ±	0.099	0.720 ±	0.17

[1] $\frac{\text{(Concentration for samples with casing)}}{\text{(Concentration for control samples)}}$ = Normalized mean value

These normalized values are the mean of all the treatments (i.e., for both pHs, organic carbon content, and concentration).

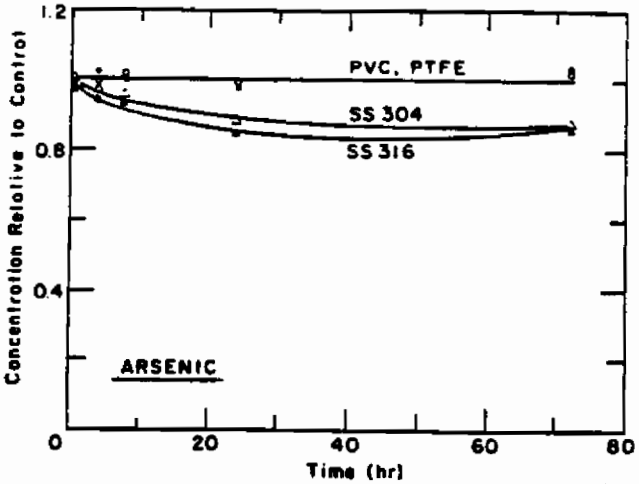

Figure 1. Trends in mean arsenic concentration for four well casing materials.

In general, there was no change in arsenic concentration for the sample solutions containing either the PVC or PTFE casings during the 72-hour test period (Figure 1), and no consistent pattern of effects was evident from the ANOVA. The reason As did not interact with these casings may be because As exists in natural waters in the anionic form (Fowler et al. 1979). Masse et al. (1981) found that anions do not strongly associate with plastic (polyethylene and PTFE) surfaces, which are known for their cation exchange capacity. The samples containing the stainless steel casings, on the other hand, showed a 10 percent decrease in aqueous arsenic concentration relative to the controls after 24 hours (Figure 1). It appears that there was no further loss of this analyte after 24 hours. Although these results cannot be used to predict exactly what losses might occur under field conditions, it is doubtful that this loss was rapid enough to impact water quality measurements (losses were less than 10 percent after eight hours).

The results for Cd are quite different. After only four hours, Cd concentrations in the samples containing PVC and stainless steel casings had increased by more than 10 percent (Figure 2), with the most leaching occurring in the samples containing the SS 316 casings. Cadmium may have been added to the PVC as a UV stabilizer (Wilson et al. 1982), and may have been added to the stainless steel to enhance resistance to chloride cracking (Sedricks 1979). The concentration of Cd in the samples containing PVC casings leveled off after eight hours. ANOVA revealed that pH had a significant effect (at the 95 percent confidence level) for this casing. Although the same amount of Cd leached in all the samples (approximately 0.5 mg/L), concentration was also significant (at the 95 percent confidence level), but only because relatively more was leached in the low-concentration samples. Concentrations in samples containing SS 304 casings decreased after eight hours and after 72 hours had returned to the same levels that were found in the control samples. Again, more Cd leached in the low pH samples. Cd was leached most rapidly in samples containing SS 316 casings. There was a large discrepancy between duplicate treatments for the samples that contained stainless steel casings. With the exception of the first set of samples ($t = 0.5$ hr), the relative standard deviations ranged from 12 to 15 percent for samples containing SS 304 and from 47 to 68 percent for those containing SS 316. In contrast, the standard deviations for samples containing PVC and PTFE casings were consistently below 6 percent. Because the variance in the samples containing SS 316 was so large, there was no consistent detectable effect of pH for these casings. However, surface oxidation appeared to be the major source of this variance. With respect to the leaching of metal stabilizers from PVC pipes, the literature indicates that loss can be a surface phenomenon that can be reduced or eliminated by either washing (with detergent) or soaking in dilute mineral acid before use (Packham 1971). It may be that the loss of Cd from PVC casings can also be reduced by a similar treatment, although we did not test this possibility.

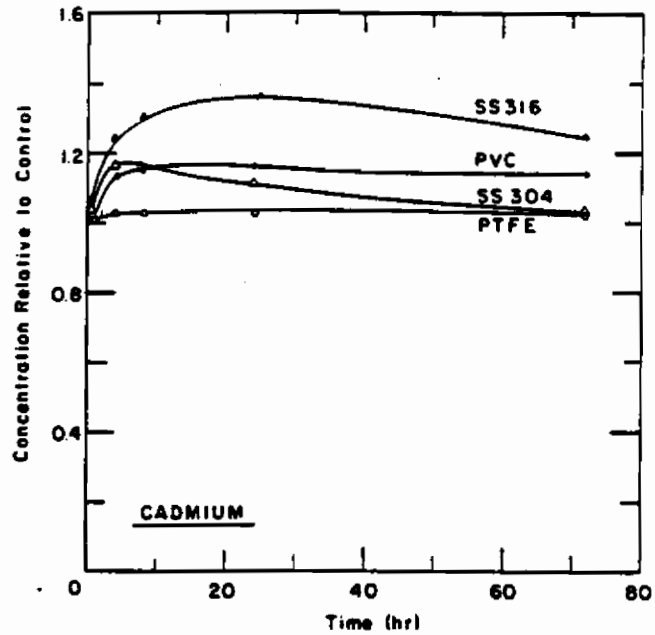

Figure 2. Trends in mean cadmium concentration for four well casing materials.

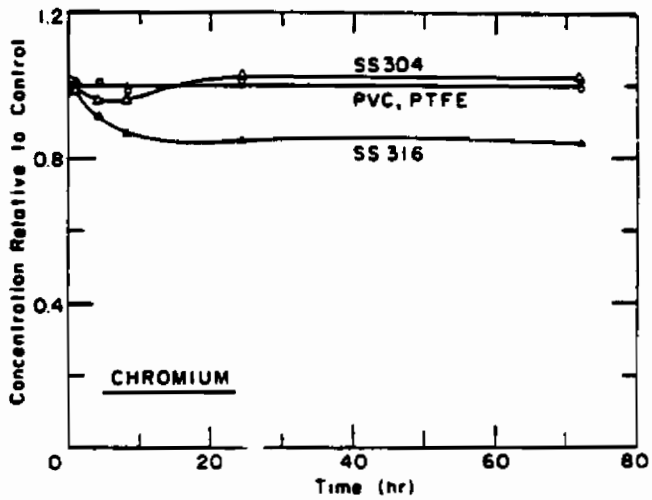

Figure 3. Trends in mean chromium concentration for four well casing materials.

There was no measurable sorption of chromium by the PTFE, PVC, and SS 304 casings (Figure 3). Absence

of interaction with the plastic casings may be due to chromium speciation. In solution, chromium exists predominantly as dichromate and chromate ($Cr_2O_7^{2-}$, CrO_4^{2-}) and, as mentioned previously, anions are not as likely to exchange with plastic surfaces. However, loss of chromium was rapid enough (13 percent after eight hours) for SS 316 casing material to be of concern for ground water monitoring. Losses were greater at the higher pH; Cr speciation is known to be affected by pH and may be responsible for some of these differences. Surface oxidation was greater at the lower pH, which likely contributed to the larger variability. Also, for those samples where a hydrous iron oxide precipitate was formed, co-precipitation may have contributed to the losses from solution. Again, the standard deviations were considerably greater for the samples containing the stainless steel casings. Humic acids apparently increased the stability of aqueous Cr, perhaps by acting as a complexing agent (Stumm and Morgan 1970s).

Lead was by far the most actively sorbed metal species. While all sample solutions containing casing materials showed some loss of Pb with time (Figure 4), PTFE was the least active surface and SS 304 was the most active. The losses for samples containing PTFE casings do not appear to be of concern with respect to ground water monitoring; losses were only 5 percent after 24 hours. However, losses for samples containing PVC and stainless casings are of concern: losses were 10 percent after only four hours in the samples containing PVC casings and 20 percent in those containing stainless casings. Although loss was initially rapid in samples containing SS 316 casings, it leveled off after eight hours. The standard deviation was higher for the samples containing SS 316 casings than for the other casings. For both stainless steel casings, there was less sorption of Pb at the lower pH where hydrogen ions may have competed for sorption sites. Added humic material apparently acted as a complexing agent in solution, making lead less prone to sorption. Concentration had no consistent effect.

Undoubtedly, there were shifts in the chemical equilibria of the well water solutions from the time the well water was collected until the end of the experiment. Ground water that is removed from an anoxic environment and exposed to oxygen-rich air may undergo redox and precipitation reactions (Stumm and Morgan 1970b). Also, lowering the pH shifts the carbonate equilibrium in solution from predominantly bicarbonate species toward carbon dioxide (Manahan 1972) and causes shifts in Cr speciation. Clearly, such changes would alter the trace metal species distribution. These possible changes were not monitored in this experiment.

For further details on this portion of the study, refer to Hewitt (1989).

Organic Study

Experimental

The four well casing materials were also tested for sorption/desorption of low levels of 10 organic substances. The substances tested were hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), 1,3,5-trinitrobenzene (TNB), cis- and trans-1,2-dichloroethylene (CDCE and TDCE), m-nitrotoluene (MNT), trichloroethylene (TCE), chlorobenzene (CLB), and o-, p- and m-dichlorobenzene (ODCB, PDCB, MDCB). The criteria used for selecting these analytes included being an EPA priority pollutant, molecular structure, solubility in water, K_{ow} value, and retention time (using reversed-phase high performance liquid chromatography [HPLC] analysis). HPLC analysis of the ground water used in these studies revealed no detectable levels of any of these substances.

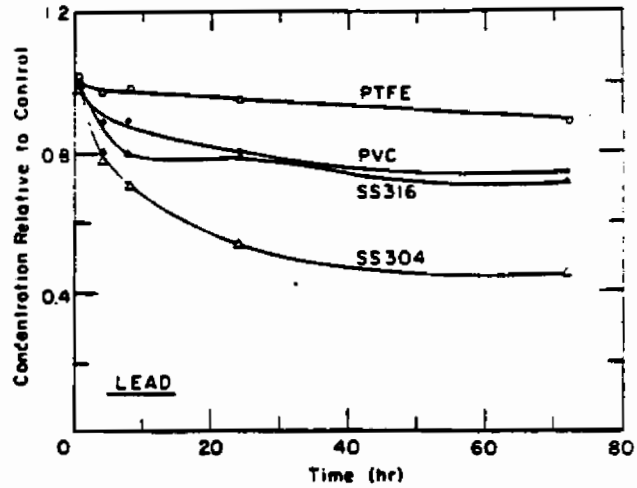

Figure 4. Trends in mean lead concentration for four well casing materials.

For these experiments, casings were cut into 11- to 14mm-long sections, which were then cut into quarters. Again, the length was varied so that the surface area could be maintained constant. The casings were washed in solutions of detergent and deionized water, rinsed many times with deionized water, drained and left to air dry. Two pieces of each type of casing were placed in 40mL glass vials that were filled with the aqueous test solution so there was no head space, and capped with Teflon-lined plastic caps. Vials with test solution but no well casing material served as controls. These controls allowed us to eliminate any effects such as those that might be due to the vials or caps. The ratio of casing surface area to solution volume was 0.79 cm^2/mL. The ratio of solution volume to volume of casing material was approximately 10:1.

In the first experiment, the test solution was prepared by adding known amounts of each of the organic solutes directly to 2.2 L of well water in a glass-stoppered bottle, which was stirred overnight. The final concentration was approximately 2 mg/L for each organic constituent. The solution also contained 40 mg/L of $HgCl_2$, which was added to prevent biodegradation of the organics. Separate vials were prepared for each sample time so that the test solution could be discarded after sampling; there were three replicate samples for each material and time. Contact times were 0 hours, one hour, eight hours, 24 hours, 72 hours (three days), 168 hours (seven days), and approximately 1000 hours (six weeks).

After an aliquot was removed for analysis from each

TABLE 3
Normalized[1] Average Concentrations of Organic Analytes for the Four Well Casings with Time

Analyte	Treatment	1 Hour	8 Hours	24 Hours	72 Hours	168 Hours	1000 Hours
RDX	PTFE	1.03	1.00	1.00	1.02	0.91	0.99
	PVC	1.01	1.00	0.98	1.00	1.02	1.00
	SS304	0.99	0.99	1.01	1.02	1.10	0.98
	SS316	1.01	0.99	1.01	1.02	1.11	1.00
TNB	PTFE	1.01	1.00	1.00	0.98	0.95	1.01
	PVC	1.01	1.00	0.98	1.02	1.01	1.02
	SS304	0.99	1.00	1.00	1.05	1.07	1.00
	SS316	1.02	0.99	1.01	1.07	1.06	1.02
C12DCE	PTFE	1.01	0.96*	0.96*	0.94	0.91*	0.79*
	PVC	1.00	0.99	0.95*	0.96	0.95	0.90
	SS304	0.97	1.00	1.00	0.96	1.04	0.98
	SS316	0.95	0.99	1.00	1.01	0.98	0.99
T12DCE	PTFE	1.00	0.92*	0.88*	0.83	0.66	0.56*
	PVC	1.00	0.98	0.93*	1.06	0.83	0.83
	SS304	0.95*	1.00	1.00	0.96	1.11	1.00
	SS316	1.00	0.99	1.00	1.12	1.03	1.00
MNT	PTFE	1.03	1.00	0.99	0.99	0.90	0.90*
	PVC	1.02	1.00	0.98	1.05	0.99	0.94
	SS304	1.00	1.00	1.01	1.00	1.08	1.07
	SS316	1.02	1.00	1.02	1.08	1.10	0.99
TCE	PTFE	1.00	0.90*	0.85*	0.78*	0.64*	0.40*
	PVE	1.01	0.98	0.94*	0.99	0.94*	0.88*
	SS304	0.96	1.00	1.01	0.96	1.04	0.99
	SS316	1.00	0.99	1.00	1.04	0.98	1.00
CLB	PTFE	1.01	0.93*	0.90*	0.85*	0.74*	0.51*
	PVC	1.01	0.98	0.95*	0.98	0.94*	0.86*
	SS304	0.98	1.00	1.00	0.97	1.05	0.99
	SS316	0.99	0.99	1.01	1.04	0.98	0.99
ODCB	PTFE	1.01	0.91*	0.88*	0.81*	0.68*	0.43*
	PVC	1.02	0.97*	0.94*	0.98	0.93	0.86*
	SS304	0.98	0.99	1.00	0.99	1.04	1.00
	SS316	1.01	0.98*	1.01	1.03	0.98	1.00
PDCB	PTFE	0.92*	0.84*	0.77*	0.64*	0.47*	0.26*
	PVC	0.95	0.95*	0.92*	0.97	0.88*	0.80*
	SS304	0.91*	0.98	1.00	0.98	1.02	1.02
	SS316	0.94	0.97*	1.00	1.04	0.97	1.02
MDCB	PTFE	1.00	0.84*	0.78*	0.66*	0.48*	0.26*
	PVC	1.02	0.95*	0.92*	0.97	0.88*	0.80*
	SS304	0.99	0.96*	1.00	0.99	1.02	1.02
	SS316	1.03	0.96*	1.00	1.04	0.96	1.01

[1] Values are determined by dividing the mean concentration of a given analyte at a given time and for a particular well casing by the mean concentration (for the same analyte) of the control samples taken at the same time.

* Values significantly different from control values ($\alpha = 0.05$)

of the 1000-hour samples, the vials were emptied and the pieces of casing were rinsed with approximately 40mL of fresh well water to remove any residual solution adhering to the surfaces. The casing pieces were then placed in new vials, and fresh unspiked well water was added. The vials were capped with new caps and allowed to equilibrate for three days. Aliquots were then taken from these samples and analyzed to determine if desorption had occurred.

In the second experiment 2.0 g/L of NaCl was also added to the test solution to determine the effect of increased ionic strength on the rates of sorption. Sampling times were the same except that the last samples were taken after approximately 1200 hours (seven weeks).

All analytical determinations were made by reversed-phase high performance liquid chromatography. A modular system was employed that consisted of a Spectra Physics SP 8810 isocratic pump, a Dynatech LC-241 autosampler with a 100-µL loop injector, a Spectra-Physics SP8490 variable wavelength UV detector set at 210 nm, a Hewlett-Packard 3393A digital integrator, and a Linear model 555 strip chart recorder. Separations were obtained on a 25cm x 4.6mm (5 µm) LC-18 column (Supelco) eluted with 1.5 mL/min of 62/38 (v/v) methanol-water. Baseline separation was achieved for all 10 analytes. Detector response was obtained from the digital integrator operating in the peak height mode. Analytical precision ranged from 0.4 to 3.98 percent, as determined by the pooled standard deviation of triplicate initial measurements.

For each analyte and sample time, a one-way analysis of variance (ANOVA) was performed to determine if the well casing material had a significant effect on analyte concentration. Where significant differences were found, Duncan's multiple range test was performed to determine which samples were significantly different from the controls.

Before the two experiments described previously were performed, a preliminary leaching study was conducted to determine if any substances that could interfere with the analytical determinations leached from the casing materials. For this study, two pieces of each type of well casing were placed in each of two vials. The vials were filled with fresh well water so that there was no headspace, capped and allowed to sit for one week. An aliquot was taken from each vial and analyzed. No detectable peaks were observed in any of the samples.

Results and Discussion

The data for the first experiment are summarized in Table 3, where the normalized concentrations for solutions containing well casings are given as a function of time. Neither type of stainless steel casing affected the concentrations of any of the analytes in solution. However, significant loss of solute did occur in the solutions that contained plastic casings. While the rate of loss differed dramatically from analyte to analyte, losses were always greater for PTFE than PVC.

For RDX and TNB there was no loss of analyte from solutions containing either plastic casing, even after 1000 hours. There was some loss of MNT in the sample solutions that contained PTFE casings but the loss only became significant after 1000 hours (10 percent loss); there was no loss with the PVC casings. TDCE was lost much more readily in samples containing PTFE casings than was its isomer pair, CDCE (Figure 5). (The solid lines shown in this figure and Figures 6-9 were fitted manually.) Figure 6 shows the losses of TCE for the four well casings. Figure 7 shows the rate of loss of the three DCB isomers and CLB in the samples that contained PTFE casings. The order of loss was PDCB and MDCB > ODCB > CLB. While the rate of loss did not exceed 10 percent in eight hours for any of the previous solutes, it is noted that losses of PDCB and MDCB were 16 percent in eight hours and thus were rapid enough to be of concern with respect to ground

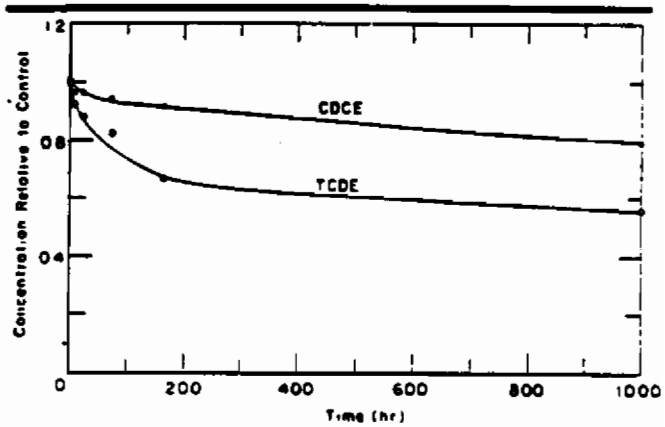

Figure 5. Sorption of CDCE and TDCE by PTFE well casings.

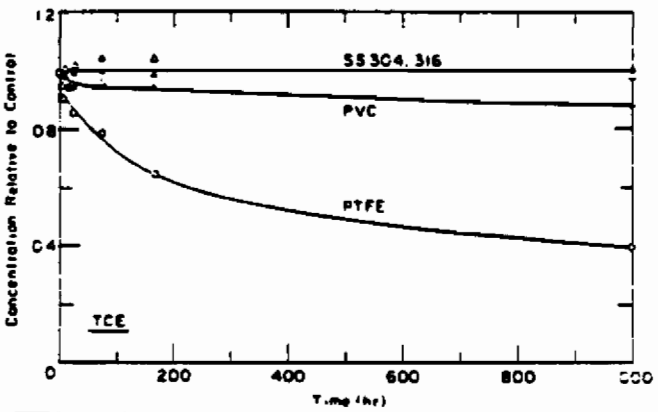

Figure 6. Sorption of TCE by the four well casing materials.

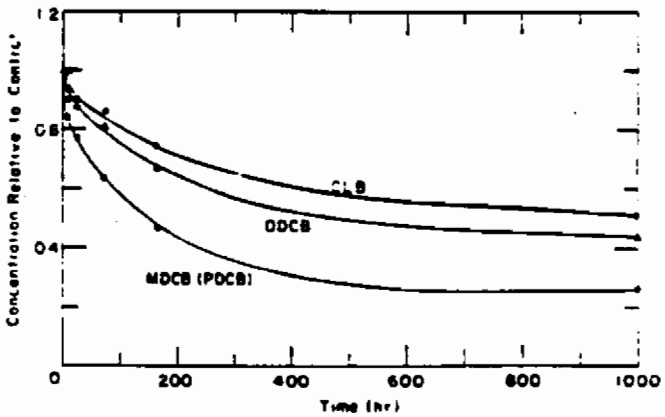

Figure 7. Sorption of CLB, ODCB, MDCB and PDCB by PTFE well casings.

TABLE 4
Results of Desorption Study

Casing Material	Concentration in mg/L after three days equilibration									
	RDX	TNB	CDCE	TDCE	MNT	TCE	CLB	ODCB	PDCB	MDCB
Teflon	ND	ND	0.20	0.43	0.075	0.47	0.28	0.38	0.30	0.35
	ND	ND	0.21	0.45	0.076	0.48	0.28	0.35	0.34	0.36
	ND	ND	*	*	0.074	*	*	*	*	*
PVC	ND	ND	0.079	0.15	0.046	0.14	0.10	0.15	0.17	0.18
	ND	ND	0.080	0.14	0.046	0.14	0.10	0.15	0.16	0.21
	ND	ND	0.080	0.15	0.043	0.13	0.11	0.16	0.16	0.20

* Results not presented because of additional loss of volatiles, probably resulting from a loose cap on this vial.
ND = Not detected.

water monitoring. For PVC, losses never reached 10 percent in eight hours for any of the organics tested, and thus the authors believe that PVC is clearly superior to PTFE for wells where water samples will be analyzed for organic constituents.

To determine if the loss of organic solutes was reversible, the pieces of casing that had been exposed to test solution for 1000 hours were rinsed and then exposed to fresh well water for three days. Measurable quantities of all the organics were recovered where significant losses had been observed (Table 4). Thus, loss was due to sorption and was at least partially reversible. Although this experiment did not give us information on the kinetics of desorption, the amount of analyte desorbed after three days generally paralleled the amount sorbed. However, PDCB and MDCB were sorbed to the greatest extent while TCE and TDCE were desorbed to the greatest extent. Therefore, it may be that diffusion out of the polymer is more rapid for smaller molecules.

In the second experiment NaCl was added to raise the chloride concentration above 1000 mg/L. High chloride concentrations are known to corrode 304 stainless steel. Specifically, tests were performed to determine if rusting would alter the sorptivity of the stainless steel surfaces. It is also possible that sorption on plastic materials would change with increasing ionic strength of the test solution.

While addition of NaCl caused rapid rusting of both stainless steel casings (<24 hr), it did not cause sorption of any of the organic solutes by them. In addition, the increased ionic strength had no detectable effect on the rate of sorption by either plastic casing (for example, Figures 8 and 9). These two figures also demonstrate the excellent reproducibility of the results from these two experiments.

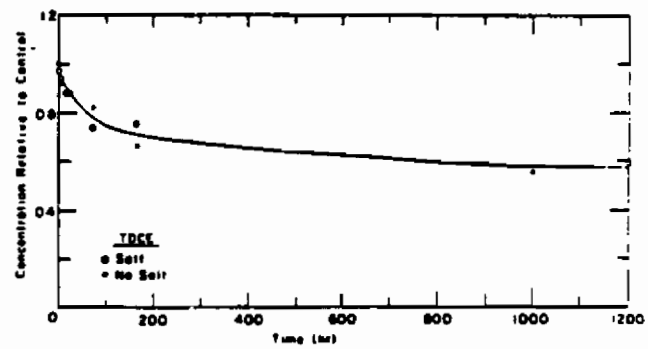

Figure 8. Sorption of TDCE by PTFE well casings in the presence and absence of salt.

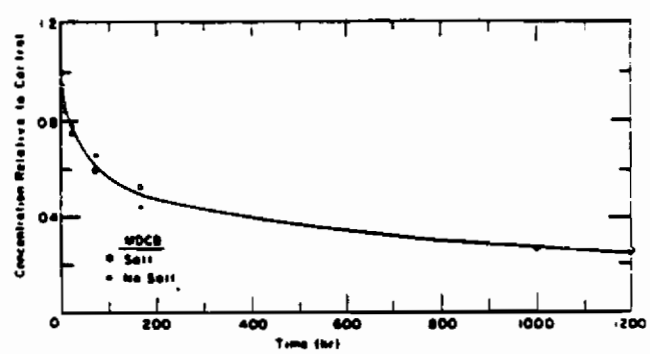

Figure 9. Sorption of MDCB by PTFE well casings in the presence and absence of salt.

Modeling the Sorption Process

These organic studies clearly demonstrated that the loss of organic chemicals from solutions exposed to plastic casing materials is via some reversible sorption process. However, it was uncertain whether this loss was due to sorption on the surface or whether there was penetration into the polymer matrix. The rate of sorption was found to be slow, with no established equilibrium after hundreds of hours. One explanation for this slow rate was that penetration into the polymer was occurring, with the rate controlled by slow diffusion within the bulk polymer and/or the rate of penetration into the small pores on the polymer surface. If it is assumed that this is the case, the process can be kinetically modeled by treating the plastic casing as an immiscible liquid phase in contact with water and relating the degree of partitioning for individual analytes to their octanol/water partition coefficients (K_{ow}). While there are immiscible liquids other than octanol that are better structural models for PTFE or PVC, the most extensive collection of partition coefficients is available for octanol.

If it is assumed that sorption is a reversible process,

$$A_w \underset{k_2}{\overset{k_1}{\rightleftharpoons}} A_s \quad . \tag{1}$$

and is first order in both directions, then the rate equation can be written as (Gould 1959):

$$\frac{d[A_w]}{dt} = -k_1 [A_w] + k_2 [A_s] \tag{2}$$

where $[A_w]$ is the concentration of solute A in aqueous solution, $[A_s]$ is the concentration of solute A in the plastic casing material, and k_1 and k_2 are the first-order rate constants for sorption and desorption, respectively.

Integration of the rate equation results in a non-linear relationship for A_w as a function of time t and two constants a and b (Equation 3), where a and b are defined in Equations 4 and 5:

$$\frac{\ln (a[A_w] + b)}{a} = t \tag{3}$$

$$a = k_1 + k_2 \tag{4}$$

$$b = 10k_2 [A_o] \tag{5}$$

where A_o is the initial concentration of solute A in aqueous solution.

Optimal values for a and b were obtained for each solute exposed to PTFE by application of the Gauss-Newton method of non-linear curve fitting using the measured concentrations at 1, 8, 24, 72, 128, and 1000 hours (Parker et al. 1989). Using determined values for a and b, the authors simultaneously solved Equations 4 and 5 for each solute to obtain estimates of k_1 and k_2. Because the process described is assumed to be reversible and first order, the ratio of the rate constants, k_1/k_2, is the equilibrium constant, K_{eq}.

When the eight values of K_{eq} were plotted vs. Log K_{ow}, six of the eight points appeared to fall on a straight line, while the points for MNT and ODCB did not (Figure 10). The poor fit for MNT and the lack of significant sorption for TNB and RDX can be explained by the tendency of nitro-containing organic molecules to form strong hydrogen bonds, which keeps them in solution. While octanol can be a donor in hydrogen bonding, PTFE cannot. Thus, if the authors predict partitioning into PTFE for these molecules based on their octanol/water coefficients, the amount of sorption for these types of compounds will be overestimated.

The poor prediction for ODCB can be explained by the well-documented "ortho effect," which is a complex combination of electronic and steric interactions that often results in ortho di-substituted aromatic molecules behaving much differently than the meta- and para-isomers.

A similar model predicting the loss of analyte for PVC was not created because the percent sorbed was small when compared with the experimental error and this would produce an unacceptable degree of uncertainty in the calculated rate constants.

Therefore, it is concluded that for hydrophobic

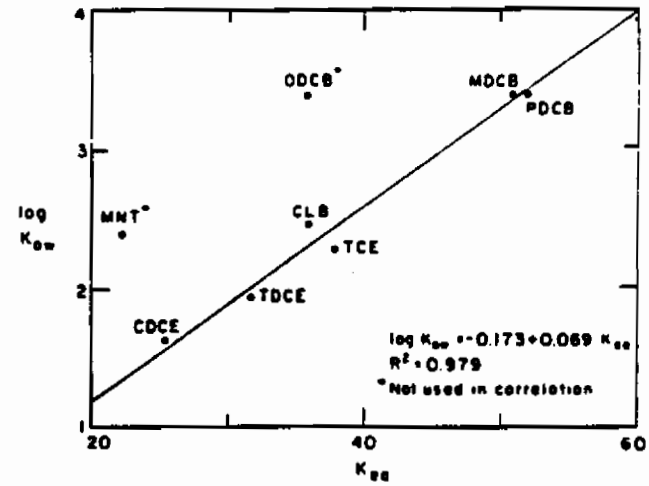

Figure 10. Correlation between log K_{ow} and K_{eq} for solutes exposed to PTFE casings.

organic molecules that are not subject to hydrogen bonding, the relationship presented in Figure 10 can be used to estimate the equilibrium partitioning of an analyte between the aqueous phase and PTFE. It is expected that losses in new wells would occur for some time until equilibrium with the water is achieved.

While K_{eq} will determine the equilibrium concentrations of each analyte in the water and plastic phases, it is the magnitude of k_1 that will determine how quickly various analytes are depleted. For small, planar molecules like TCE, the k_1 values are quite high compared to the other analytes. This may explain the rapid loss of tetrachloroethylene from solutions containing PTFE casings observed by Miller (1982) and Reynolds and Gillham (1986).

Because the rate of sorption appears to be first order, the relative concentration (concentration at a given time relative to its initial concentration) is independent of initial concentration (Castellan 1964). Thus, the percent loss at a given exposure time is expected to be independent of concentration, as was also predicted by the model of Reynolds and Gillham (1986). We did not confirm this, however, by conducting the test at several concentrations.

For further details on the organic portion of this study, refer to Parker et al. (1989).

Summary and Conclusions

In summary, the inorganic study indicated that three of the metals (As, Cr and Pb) were sorbed by one or more of the casing materials. Specifically, Cr was sorbed by SS 316 casings, As was sorbed by both 304 and 316 stainless steel casings, and Pb was sorbed by all four casings. On the other hand, Cd leached from the stainless steel and PVC casings, although subsequent sorption lowered concentrations in the samples containing stainless steel casings. While sorption of As was slow enough that it is probably not of concern for ground water monitoring, the changes in the Cr, Cd and Pb concentrations are of concern. Both SS 304 and 316 casings were subject to surface oxidation, presumably by galvanic action, which apparently provided active sites for sorption and release of major and minor constitu-

ents. Sorption and leaching of metal species was affected in some cases by the ground water composition (pH and organic carbon content). Specifically, there was more leaching of Cd and less sorption of Pb at the lower pH. Our results indicate that humic material may have acted as a complexing agent, making lead and chromium less prone to sorption. If chemical interactions are used as the only criterion, PTFE is clearly the best candidate for monitoring metal species in ground water. PVC would be a good second choice because its performance was considerably better than either SS 304 or SS 316 casing.

In contrast, the organic studies clearly indicated that PTFE was the poorest choice of the four well casing materials tested. PTFE casings sorbed all the chlorinated compounds and one nitroaromatic compound, and losses of PDCB and MDCB were rapid enough to be of concern for ground water monitoring. PVC casings also sorbed some of the same compounds, but always at rates that were considerably slower than those observed for PTFE casings. The rates of these losses on PVC were slow enough that they did not appear to be of concern for ground water monitoring. There was no loss of any of the organic solutes in the presence of either type of SS casing.

The desorption study showed that the loss of organics from aqueous solution is due to a sorption process that was reversible, or at least partially so. Desorption from contaminated casings could potentially result in falsely high concentrations of analytes if the concentrations of the analytes in the ground water were to drop.

The loss of hydrophobic organic constituents in the samples containing PTFE casings could be correlated with the substance's K_{ow} values. However, this correlation overestimates losses for hydrophilic organic substances.

There are several effects that make extrapolating these test data to a real monitoring situation difficult:

- Casings were tested and not well screens. The rate of sorption could be substantially greater in the screened portions of the well because the surface area of the screened portion would be greater.
- This experiment was conducted under static conditions. The effect of sorption under real conditions would be mitigated to some degree, depending on the rate of exchange of water between the aquifer and well casing.

Clearly, choosing one casing material for samples that will be analyzed for both trace metals and organics involves compromise. However, based on the results of the tests that the authors have performed to date, PVC appears to be the best compromise choice of the four casing materials tested.

Future studies will examine leaching of inorganic and organic solutes, the effect of low dissolved oxygen on interactions between the metals and well casings, and the suitability of other materials for ground water monitoring.

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Potential of Common Well Casing Materials to Influence Aqueous Metal Concentrations

by Alan D. Hewitt

Abstract

Static leaching and sorption laboratory studies were performed to assess the potential of polyvinyl chloride (PVC), polytetrafluoroethylene (PTFE), and two types of stainless steel (SS 304 and SS 316) well casing materials to influence metal concentrations in ground water solutions with low dissolved oxygen. Overall, PTFE was inert, whereas one or both stainless steels significantly altered the solution concentrations of Cd, Cr, Cu, Pb, Fe, and Ni. PVC was generally more reactive than PTFE, but did not significantly alter the solution metal concentrations as often, or as greatly, as either of the stainless casings.

Introduction

The validity of estimates of analyte concentration in ground water samples collected from monitoring wells has recently received considerable attention. This issue, with regard to the selection of a monitoring well construction material, stems from the U.S. Environmental Protection Agency (U.S. EPA) recommendation that stainless steel and polytetrafluoroethylene (PTFE) be d instead of polyvinyl chloride (PVC) when volatile organic compounds will be analyzed during the well's lifetime (U.S. EPA 1986). Because screening for all hazardous waste analytes regulated by the U.S. EPA must be performed at least once, this recommendation is interpreted by some agencies as prohibiting the use of PVC.

A review of the literature published prior to 1986 reveals no substantial evidence (nor were any references provided in U.S. EPA [1986]) for the basis of this decision. Subsequent well casing studies concerned with material effects on solution analyte concentration have observed the following. During ground water sample collection from steel and stainless steel (SS) wells under stagnant condition and after purging, leaching of Fe, Cd, Cr, and Mn has been observed (Houghton and Berger 1984, Barcelona and Helfrich 1986). Laboratory studies monitoring the metals listed in the National Interim Primary Drinking Water Regulations (NIPDWR, Table 1), found either or both SS 316 and SS 304 to affect the solution concentration of Ba, Cr, Cu, and Pb, while PVC and PTFE were far less influential (Hewitt 1989, Parker et al. 1990). Laboratory studies concerned with organic analytes (Gillham and O'Hannesin 1988, Parker et al. 1990, Reynolds et al. 1990) orted that sorption of several halogenated com- unds (i.e., tetrachloroethylene) was more rapid for TFE than PVC. Although none of these studies can predict the actual effects that will be incurred when sampling from a well, they do address the issue of material inertness. As the time between well purging and sampling diminishes, so does the issue of well casing material effects (Nielsen 1988).

In this study, leaching and sorption experiments were performed comparing PVC, PTFE, SS 304 and SS 316 well casing materials in low dissolved oxygen (DO) solutions. The low DO condition was imposed to eliminate the development of visible surface oxidation on the stainless casings. In previous studies (Hewitt 1989, Parker et al. 1990) roughly half of the stainless steel casings developed rust sites. Surface oxidation, presumably by galvanic action, could explain the significant effects observed for the stainless steels. In addition, the low-DO condition addresses the anoxic conditions common to very deep wells, where material strength requirements, combined with U.S. EPA material recommendations, currently limit well casing selection to only the stainless steels.

Materials and Methods

Materials

Sections of PVC, PTFE, SS 304, and SS 316 well casings (1.2m long, 5.0cm I.D.) specifically manufactured (factory cleaned) for ground water monitoring

TABLE 1
National Interim Primary Drinking Water Regulation Levels (*Federal Register* 1975)

Metal	NIPDWR Levels (μg/L)
As	50
Ba	1000
Cd	10
Cr	50
Pb	50
Hg	2
Se	10
Ag	50

were cut in approximately 2cm lengths. The exact lengths of the casing rings were adjusted based on the pipe's diameter and wall thickness to normalize the surface area (80 cm^2). During pipe milling (cutting and edge filing), precautions were taken to prevent exposure to grease, dirt, solvents, and other foreign substances. Casing rings were individually rinsed several times prior to use with deionized distilled water, and air dried in a Class 100 clean air station. All cleaning and subsequent operations were performed within a cleanroom complex, and plastic gloves or nylon tweezers were used to handle the rings.

Polypropylene jars (69mm O.D. x 62mm high, 125mL) were used as exposure vessels for individual casing rings. These vessels and all other materials (i.e., collection bottles, tubing, etc.) that came into contact with the well water were appropriately cleaned with either dilute nitric acid or soap and water followed by several rinses with deionized distilled water. A glove bag served as the nitrogen environmental chamber for these low-DO experiments. The ground water used here and previously (Hewitt 1989, Parker et al. 1990) was collected from a 76m-deep domestic artesian well located in Weathersfield, Vermont.

Test Design and Setup

Experiments designed to study both the sorption and leaching of metals were performed in a positive nitrogen atmospheric chamber. Low dissolved oxygen water was created by purging with nitrogen, thereby lowering this constituent from its native level of 9.0 mg/L to below 1.0 mg/L (Table 2). In the leaching experiment, the metals analyzed were Cd, Cr, Cu, Pb, Fe, and Ni. The sorption experiment studied the solution concentrations of Cd, Cr, Cu, and Pb, introduced at concentrations that were approximately one-fifth the NIPDWR (Table 1). The concentration of native Fe in the water was also monitored in the sorption study. The metal analytes in this study were major constituents of stainless steel or had previously been found to be influenced by casing materials (Hewitt 1989, Parker et al. 1990). Hewitt (1991) provides a more detailed discussion of the experimental setup and procedure.

For the leaching experiment, triplicates of each casing material and the control (no casing) were prepared for treatment periods of two, eight, 24, and 120 hours. Casing rings were submerged in 60mL of water inside capped vessels. After treatment each casing ring was removed from the vessel and the remaining solution (60mL) was acidified, thus sacrificing the sample and vessel. This sample collection method was deemed necessary for the leaching study, because released metals, particularly cations, could be lost to the plastic vessel walls (Masse et al. 1981). In addition to the samples and control, four additional vessels without well casings were included, one for each exposure period, to monitor pH, DO, and oxidation/reduction potential (ORP).

The sorption study followed this same experimental design, with triplicates of the four casing materials and the control, and a vessel for monitoring the solution parameters for each treatment period. Here, sample aliquots of 2.5mL were removed and acidified after two, eight, 24, and 72 hours of treatment, from an initial solution volume of 100mL. Sample aliquots could be removed in this fashion because the controls could account for the loss of metals to the vessel walls.

Analysis

Metal analyses were performed using Graphite Furnace Atomic Absorption (GFAA) with a Perkin-Elmer

TABLE 2
Ground Water Parameters Measured In Situ and for Experimental Monitoring Solutions

	DO (mg/L)	pH	ORP (mV)	Conductance (μmhos)
In situ ground water	9.0	7.4	280	*230
Leaching experiment monitoring solutions				
Stock	0.4	8.4	190	240
2 hr	1.3	8.4	180	—
8 hr	1.2	8.4	180	—
24 hr	1.7	8.7	180	—
120 hr	0.6	8.9	170	—
Sorption experiment monitoring solutions				
Stock	0.9	8.1	200	—
2 hr	1.8	8.1	—	—
8 hr	1.6	8.1	190	—
24 hr	0.8	8.5	170	—
72 hr	0.3	8.9	150	—

*Conductivity of ground water measured just prior to purging.

Model 403 Atomic Absorption Spectrophotometer (AAS) coupled with a Perkin-Elmer Model 2200 heated graphite atomizer. Instrumental procedures followed the guidelines provided in the manufacturer's instrument manual (Perkin-Elmer 1981). The analytical procedures were designed to achieve method detection limits (MDLs) below 1 percent of the NIPDWR levels (Table 1). The MDLs were established as described in the *Federal Register* (1984).

Dissolved oxygen, pH, and ORP were determined spectrophotometrically using high-range AccuVac reagent vials (Hach 25150) and a Dr/2 spectrometer (Hach), with a semimicro glass combination Ross Model 81-03 electrode (Orion), and with a Model 97-78-00 platinum redox electrode (Orion), respectively.

For each experiment and metal the data for the sample triplicates of each casing material and control were subjected to a one-way analysis of variance (ANOVA) and a least-significant-difference (LSD) test at the 95 percent confidence level.

Results

Leaching Experiment

Table 3 shows the results for the statistical analyses of the Cd, Cu, Cr, Pb, Fe, and Ni concentrations determined. PTFE was not observed to leach any of the metals determined, relative to the control. PVC leached significantly more Pb for the 24-hour treatment period, while SS 304 leached more Pb for the 24- and 120-hour treatment periods and more Cd for the two- and eight-hour treatment periods, relative to PTFE and the control. Stainless steel 316 leached significantly more Cd for two- and eight-hour treatment periods, and frequently leached more Cu, Fe, and Ni in comparison to PTFE, PVC, and the control. Ranking the materials based on their tendency to leach the metals studied shows that PTFE < PVC < SS 304 << SS 316.

Sorption Experiment

Table 4 shows the results of the statistical analyses for the spiked metals and native Fe. This analysis did not reveal any statistically significant differences between PTFE and the control or between PVC and PTFE. Stainless steel 316 showed significant leaching of Cu and sorption of Pb for three out of four treatment periods, while SS 304 sorbed more Cd, Cr, and Pb for at least half the treatment periods relative to PTFE, PVC, and the control. Ranking the materials based on their ability to sorb the metals studied shows that PTFE < PVC < SS 316 << SS 304.

Discussion

From the time of ground water collection to the end of each of the experiments there were shifts in chemical equilibria. The low DO condition, however, did prevent visible surface oxidation from forming on the stainless steel casings, as was observed in our earlier studies (Hewitt 1989, Parker et al. 1990). The DO in earlier efforts was around 9.0 mg/L, the same as the in situ concentration determined for this study (Table 2). This high level of DO has previously been cited as being corrosive (Aller et al. 1989).

Assessing first those metals that are major constituents of one of the materials tested reveals the expected: the two stainless casings leached Fe, Ni, and Cr (Table 3), and SS 304 sorbed Cr (Table 4). Clearly, samples that are to be analyzed for a given analyte should not be exposed to materials containing that analyte.

With regard to the aqueous concentrations of Cd, Cu, and Pb, PTFE was the least reactive material, and the stainless steels the most reactive in terms of releasing or providing sites for sorption. This finding is also consistent with earlier laboratory studies (Hewitt 1989, Parker et al. 1990), indicating that independent of visible corrosion, active sites exist on stainless steel casings that can either release or sorb metals of concern to human health.

Common to these experiments and our previous studies (Hewitt 1989, Parker et al. 1990) were aberrant aqueous metal concentrations determined for individual samples that could be treated as outliers. In all cases the aberrant concentrations were found in samples exposed to the stainless steel casings. This frequently resulted in variances that were not homogeneous with the other casing materials. The comparison of inhomogeneous variances weakens the statistical analysis, making the interpretation overly conservative. This explains why significant differences were not distinguished in some cases where the mean concentrations were numerically different by as much as an order of magnitude. The author has chosen to handle the data in this fashion because, in his opinion, the aberrant values were not random, but inherent to the stainless steel casing material.

The application of static laboratory findings to the dynamic and environmentally sensitive conditions that exist for sampling ground water is not straightforward. However, because the two-hour treatment period showed significant leaching by both stainless steel casings and sorption by both stainless steel and PVC (Pb only) casings (Table 5), the potential material effects demonstrated here cannot be easily dismissed with respect to the time lapse between purging and sampling.

Conclusion

If only metal analytes are of concern, PTFE is the best material for ground water monitoring wells with respect to material inertness. Ground water samples analyzed for trace metals would be more suspect if taken from wells constructed with stainless steel than if taken from wells made of either PVC or PTFE. This finding holds for both corrosive (Hewitt 1989, Parker et al. 1990) and non-corrosive environments. Studies concerned with levels of aqueous organic constituents have shown PTFE to be more prone to sorption of analytes than either PVC or stainless steel (Gillham and O'Hannesin 1988, Parker et al. 1990, Reynolds et al. 1990). In terms of a material's inertness, PVC is the best compromise among those tested here, for monitoring wells installed to monitor trace levels or for the early detection of contaminants in ground water.

TABLE 3

Summary of Statistical Analyses for Average Analyte Concentrations (μg/L) During the Leaching Experiment. (Materials with common underlining are not different at the 95 percent confidence level as determined by the least significant difference [LSD].)

Static Leaching Experiment

Time	Well Casing					
Cadmium						
2 hr	Control	PTFE	PVC	SS 304	SS316	(LSD = 0.16)
	0.03	0.04	0.10	0.22	0.36	
8 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 0.36)
	0.03	0.03	0.22	0.40	0.49	
24 hr	Control	PTFE	SS 304	SS 316	PVC	(LSD = 0.29)
	0.03	0.03	0.17	0.20	0.27	
120 hr	Control	PTFE	SS 316	SS 304	PVC	(LSD = 0.28)
	0.03	0.03	0.04	0.09	0.24	
Chromium						
2 hr	Control	PTFE	SS 304	PVC	SS 316	(LSD = 1.12)
	0.24	0.28	0.62	0.72	1.35	
8 hr	Control	PTFE	PVC	SS 316	SS 304	(LSD = 5.91)
	0.29	0.35	0.38	2.04	4.44	
24 hr	Control	PTFE	PVC	SS 316	SS 304	(LSD = 2.59)
	0.28	0.30	0.68	1.89	2.29	
120 hr	PTFE	Control	PVC	SS 316	SS 304	(LSD = 3.25)
	0.34	0.37	0.38	2.19	3.06	
Copper						
2 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 11.5)
	0.47	1.13	1.85	6.90	31.2	
8 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 15.3)
	0.49	0.73	1.44	5.02	25.3	
24 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 8.67)
	0.50	0.70	2.35	8.09	20.0	
120 hr	Control	PTFE	PVC	SS 304	SS 316	SD = 7.02)
	0.49	0.99	1.66	3.56	16.2	

Time	Well Casing					
Lead						
2 hr	Control	PTFE	SS 304	SS 316	PVC	(LSD = 0.98)
	0.10	0.14	0.55	0.79	0.94	
8 hr	Control	PTFE	PVC	SS 316	SS 304	(LSD = 11.7)
	0.10	0.18	0.36	0.95	6.58	
24 hr	Control	PTFE	SS 316	PVC	SS 304	(LSD = 0.59)
	0.10	0.18	0.27	0.93	1.42	
120 hr	Control	PTFE	SS 316	PVC	SS 304	(LSD = 0.55)
	0.10	0.12	0.34	0.36	1.65	
Iron						
2 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 7.65)
	9.93	11.4	12.0	16.7	22.7	
8 hr	Control	PVC	PTFE	SS 304	SS 316	(LSD = 85.8)
	9.77	11.0	13.4	14.9	55.6	
24 hr	PTFE	Control	PVC	SS 304	SS 316	(LSD = 16.1)
	9.50	9.80	11.5	20.0	28.9	
120 hr	PVC	PTFE	Control	SS 316	SS 304	(LSD = 40.8)
	9.10	9.60	10.0	17.1	48.2	
Nickel						
2 hr	Control	PVC	PTFE	SS 304	SS 316	(LSD = 6.9)
	2.2	2.2	2.4	3.2	13.5	
8 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 5.2)
	2.2	2.2	2.2	3.52	16.0	
24 hr	Control	PTFE	PVC	SS 304	SS 316	(LSD = 3.0)
	2.2	2.2	2.2	5.0	10.4	
120 hr	Control	PVC	PTFE	SS 304	SS 316	(LSD = 8.7)
	2.2	2.2	2.4	6.1	12.0	

TABLE 4

Summary of Statistical Analyses for Average Analyte Concentrations (μg/L) During the Sorption Experiment. (Materials with common underlining are not different at the 95 percent confidence level as determined by the least significant difference [LSD].)

Sorption Experiment

Analyte	Time	Well Casing					LSD
Cadmium	2 hr	SS 304	PTFE	Control	PVC	SS 316	(LSD = 0.12)
		2.18	2.24	2.28	2.28	2.31	
	8 hr	SS 304	SS 316	PVC	PTFE	Control	(LSD = 0.20)
		1.85	2.16	2.19	2.22	2.25	
	24 hr	SS 304	SS 316	PVC	PTFE	Control	(LSD = 0.29)
		1.48	1.96	2.11	2.19	2.23	
	72 hr	SS 304	PVC	SS 316	Control	PTFE	(LSD = 1.42)
		0.82	1.27	1.46	2.04	2.13	
Chromium	2 hr	SS 304	PTFE	Control	PVC	SS 316	(LSD = 0.79)
		11.3	12.1	12.2	12.3	12.4	
	8 hr	SS 304	PTFE	Control	SS 316	PVC	(LSD = 1.36)
		10.7	12.1	12.1	12.2	12.4	
	24 hr	SS 304	Control	PTFE	PVC	SS 316	(LSD = 1.45)
		10.5	12.2	12.2	12.4	12.5	
	72 hr	SS 304	SS 316	Control	PTFE	PVC	(LSD = 4.36)
		8.36	11.4	11.9	12.1	12.5	
Copper	2 hr	PTFE	Control	PVC	SS 304	SS 316	(LSD = 7.42)
		10.4	10.5	10.8	12.2	23.2	
	8 hr	SS 304	PTFE	PVC	Control	SS 316	(LSD = 7.55)
		9.33	9.93	10.2	10.7	27.6	
	24 hr	SS 304	PVC	PTFE	Control	SS 316	(LSD = 7.39)
		6.84	9.41	9.61	9.91	30.0	
	72 hr	SS 304	PVC	PTFE	Control	SS 316	(LSD = 10.9)
		4.48	6.24	8.75	9.38	18.9	
Lead	2 hr	SS 316	SS 304	PVC	PTFE	Control	(LSD = 0.61)
		8.56	8.73	9.32	9.83	10.1	
	8 hr	SS 316	SS 304	PVC	PTFE	Control	(LSD = 1.45)
		5.17	5.73	8.49	9.54	9.98	
	24 hr	SS 316	SS 304	PVC	PTFE	Control	(LSD = 2.05)
		2.94	3.65	7.98	9.11	9.62	
	72 hr	SS 316	SS 304	PVC	Control	PTFE	(LSD = 4.50)
		1.64	2.26	4.45	8.42	8.51	
Iron	2 hr	PVC	Control	PTFE	SS 316	SS 304	(LSD = 16.9)
		8.76	9.11	10.9	13.2	19.6	
	8 hr	Control	PTFE	PVC	SS 316	SS 304	(LSD = 17.1)
		8.66	8.71	8.97	12.3	19.6	
	24 hr	PTFE	PVC	Control	SS 316	SS 304	(LSD = 15.6)
		7.75	8.31	8.08	11.8	18.9	
	72 hr	PTFE	PVC	Control	SS 316	SS 304	(LSD = 6.61)
		6.91	6.93	7.35	9.89	11.3	

TABLE 5
Well Casing Material(s) that Leached or Sorbed a Significantly Greater Amount Relative to the Control, for a Two-Hour Treatment Period

	Metal Influenced					
	Fe	Ni	Cd	Cu	Cr	Pb
Leached	SS 316 SS 304	SS 316	SS 316 SS 304	SS 316	—	—
Sorbed	—	—	—	—	SS 304	SS 316 SS 304 PVC

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Biographical Sketch

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Information Requirements for Justification of Alternative Well Casing Materials for Groundwater Monitoring Well Construction

I. EPA Region IV requires that groundwater monitoring wells be constructed of stainless steel (304 or 316 - first choice) or rigid PVC meeting NSF Standard 14 ("NSF WC" - second choice). Which of these well casing materials to be used depends upon which would obtain the most representative groundwater sample. A justification must be submitted when monitoring wells constructed of PVC materials are proposed for use in collecting samples for organic analysis. Following are EPA's information requirements for justifying the use of PVC as the well casing material for groundwater monitoring wells.

1. The Data Quality Objectives (DQO) for the samples to be collected from wells with PVC casing per EPA/540/G-87/003, Data Quality Objectives for Remedial Response Activities.

2. The anticipated compounds and their concentration ranges.

3. The anticipated residence time of the sample in the well.

4. The aquifer's productivity.

5. The reasons for not using hybrid wells of PVC casings and stainless steel screens.

6. Brief discussion of adsorption/desorption characteristics of the compounds and elements of interest for the type of PVC to be used.

7. Whether an anticipated increase in thickness of the monitor well wall would require a larger annular space.

8. The type of PVC to be used and, if available, the manufacturer's specifications. Additionally, assurance that the PVC to be used does not leach, mask, react or otherwise interfere with the contaminants being monitored within the limits of the DQOs.

II. EPA acceptance of PVC well casing materials does not constitute approval of that casing material; therefore, if PVC is accepted for use, the following conditions shall apply:

1. The FACILITY accepts the risks that the use of alternate materials for groundwater monitoring may cause interferences or inaccuracies in the chemical analysis of samples from such wells. All compounds found in samples collected from the well will be considered to originate in the aquifer being monitored.

2. Any such acceptance applies to the implementation of the specified RFI Work Plan only, and any other use of alternate materials for groundwater monitoring must be granted by EPA separately.

3. Any major amendments or revisions to the referenced RFI Work Plan or the intended DQOs of the work plan may require reassessment of the acceptance for use of alternate materials by EPA.

4. EPA reserves the right to refuse groundwater monitoring data from groundwater wells constructed of alternate materials from those specified in the Region IV SOP whenever such construction materials could cause the ground water monitoring data to fail to meet the necessary DQOs.

III. The information to justify the use of PVC well casing could be incorporated into the work plan and be inclusive for all sites where PVC casing will be used.

IV. All field work and laboratory procedures must follow EPA Region IV Standard Operating Procedure Quality Assurance Manuals (SOPQAM). The SOPQAM for field procedures is dated February 1991, and the SOPQAM for laboratory procedures is dated September 1990. Any deviation from EPA Region IV SOPQAM must be justified in writing and be approved by EPA.

August 2. 1991

APPENDIX S

Health and Safety Training Certificates

APPENDIX T

Material Safety Data Sheets

APPENDIX U

E/A & H Corporate Health and Safety Plan